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REPORTS FROM THE ANNUAL MEETING
(*Part I*)

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Progress and Trends in Public Health in North America*

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THE thought of the political, social, and scientific amenities which have characterized the contacts of our two countries and of our people for so many years imbues me with the kindly spirit of neighbourliness whenever I come to your country, or you come to ours, and always arouses the pleasant emotions of a long friendship. On the occasion of such visits as this, we are not as strangers in a foreign country, but as neighbours who have travelled so long a way on the road of friendly co-operation and mutual good will that we can pleasantly sit down together.

It would, indeed, be superfluous for me to say that it is a real pleasure to have the privilege of addressing your association, whose members are engaged in the important public health work that is being done in the Dominion. Canada and the United States have much in common. Broadly speaking, we are of a common origin; we have a common language; and in many respects our problems are identical or similar.

For many years the most cordial relations between the Canadian public health authorities and the United States Public Health Service have been a source of great satisfaction to me. Our quarantine and immigration work at ports on both the east and west coasts is frequently done by our representatives working side by side, and, on occasion, it is reciprocal. In 1925, when a number of officers of the Public Health Service were sent abroad in connection with the inauguration of a plan for the examination of aliens in countries of origin prior to admission to the United States, it was a pleasure to work in close co-operation with the medical representatives from the immigration service of Canada.

It is of distinct value for us to pause at intervals to view the accomplishments of the past, to look about us in order to appraise our immediate problems, and possibly to cast an eye to the future in order to see what may be ahead. Therefore, to-day I shall endeavour to survey briefly the progress in public health work with especial reference to the past decade or so. We shall

**Presented by Dr. John A. Ferrell, Associate Director of the International Health Division, the Rockefeller Foundation, New York, before a joint session of the Canadian Public Health Association, the Ontario Health Officers' Association, and the Canadian Social Hygiene Council, Toronto, June 3, 1935.*

also look about us at our immediate tasks and consider what must be accomplished for the future.

One of the important developments of recent years has been the awakening of a sanitary conscience. Preventive medicine of the present day teaches that we must safeguard our own body against infection and keep it clean not only for our own sake but quite as much for our neighbours' sake.

In the early days of the development of our continent, many of the pioneers felt crowded and experienced a lack of "elbow room" if they had a neighbour nearer than five or ten miles, but the frontiers of former days are passing. This is less true in Canada than in the United States. You still have large areas yet to be occupied by settlers. Both Canada and the United States are, however, beginning to consider the many questions that arise with increasing density in population, such as the problems of sanitation and disease control which become more acute in the more thickly populated centres.

Our conception of public health has been broadened so that modern public health is concerned not only with stamping out communicable disease but with a much broader aspect of the subject. There are many preventable defects which can be reached, especially in the school child and the industrial worker. Present day preventive medicine must concern itself not only with questions of immunity from disease but with health hazards of occupation and with the food supply, housing, and economic conditions.

Glancing back a generation we find that there has been a sharp decline in certain diseases which once took a heavy toll from our population. Half a century ago tuberculosis caused more than 320 deaths annually in every 100,000 of the population of Massachusetts; and, probably, this rate is not higher than the rates for other states of the United States for which records are not available. To-day, tuberculosis causes considerably less than one-fifth of this number of deaths. While the reduction of the death rate from tuberculosis has undoubtedly been due in part to natural causes, it is probable that much of it has been the result of public health activities. Within the decade from 1923 to 1933, in the registration area of Canada, the death rate from all forms of tuberculosis has dropped from 73 per 100,000 in 1923 to 52 in 1933. In the United States registration area for the same period, we have also had a satisfactory decline from 93 to 60 per 100,000.

Diphtheria is one of the communicable diseases of which we know the cause and mode of transmission and for which we now possess a specific preventive and curative agent of great potency, as well as a reliable test to determine the susceptibility of an individual. The introduction of the use of toxin-antitoxin and of toxoid has placed in the hands of health authorities a valuable weapon for further combating this disease. The death rate from diphtheria has quickly responded to these medical discoveries. To our Canadian co-workers is due much credit for work in connection with the development of toxoid for use in the prevention of diphtheria. A striking reduction in the death rate from diphtheria has been made in your country within the same decade. In 1923 the death rate from this cause in the registration area of Canada was 13 per 100,000 population; in 1933, it was 1.5 per 100,000. Al-

though we have had a reduction from 12 per 100,000 in 1923 to 4 in 1933, we have not been able to duplicate the splendid record set for us by you.

The sharp reduction in the prevalence of typhoid fever on the continent of North America is another example of the effectiveness of the application of principles of sanitary science. This disease, which formerly took a heavy toll in both Canada and the United States, is now such a relatively rare disease that, I am informed, the teachers of medicine sometimes have difficulty in finding cases of typhoid fever for use in clinical demonstrations. In 1923 the death rate from typhoid fever in the registration areas of both Canada and the United States was 7 per 100,000 population. In 1933 the rate in your country had dropped to 2, and that for the United States to 4.

It is said that before the days of vaccination only from 5 to 10 people out of every hundred escaped smallpox; and of those who contracted the disease about one person out of every 4 died. Many of those who recovered were disfigured and some were blinded for life. The disease was so much feared and people were so sure that they would contract it that many persons had themselves inoculated with smallpox so as to have it over with. Many of those who were thus voluntarily inoculated died, but the death rate among the inoculated was much less than among those who contracted the disease in other ways.

There has been a decided decrease in the prevalence of smallpox in the United States within the past few years, but in comparatively recent times the United States had the unenviable distinction of being exceeded by only one country in the number of cases of smallpox reported—and that country was British India. The development of the immune reaction as a diagnostic test of susceptibility has been most useful in providing health officers with an important means for determining those susceptible to smallpox. Although in Canada you have had several sharp outbreaks of smallpox, in general the trend of the disease apparently is decreasing.

I have mentioned only a few of the diseases which are important from a public health standpoint in the control and prevention of which we have made satisfactory progress. In considering the general subject for discussion with you to-day, I have taken occasion to compare the ten principal causes of death for Canada and for the United States. By and large our problems are quite similar. However, there are several interesting differences in the relative importance of the leading causes of death in the two countries. Some of these differences may be due to variations in classification or nomenclature; others, however, may be due to various other factors. I find that heart disease is number 1 on the list of causes of death in both countries. The rate in Canada was 145 per 100,000 in 1933, as compared with 228 in the United States for the same year. The second principal cause of death is also the same for both countries—cancer, the rate being 100 per 100,000 in Canada and 102 in the United States. The third leading cause of death in Canada is diseases of early infancy, with a rate of 69 per 100,000, whereas in the United States this cause is number 8, with a rate of 41 per 100,000. The third principal cause of death in the United States is violent deaths, with a rate of 98 per 100,000,

a somewhat illuminating but rather sad commentary upon our traffic and industrial hazards.

Diseases of the arteries appear as number 4 on the causes of deaths for you, with a rate of 65 per 100,000 in 1933, while for us it drops in place to number 10, with a rate of 20 per 100,000. In the United States, 4th place is occupied by cerebral hemorrhage, with a rate of 84 per 100,000.

Tuberculosis is number 5 on your list with a rate of 63 per 100,000 in 1933. With us, it is number 7, with a rate of 60 per 100,000 in 1933. Fifth place in our mortality statistics is occupied by nephritis, with a rate of 83 per 100,000 in 1933. With you this cause is number 8, with a rate of 52.

For the 6th cause of death, we again agree, pneumonia occupying this place in both countries. Your death rate from pneumonia in 1933 per 100,000 was 61; in the United States it was 69.

I should like to insert, for the printed record, a table that you may find of interest in comparing the relative positions of several of the principal causes of death in the two countries.

PRINCIPAL CAUSES OF DEATH IN 1933 IN CANADA AND COMPARATIVE RATES FOR THE UNITED STATES
(Rates per 100,000 population)

International List Number	Disease	Canada		United States	
		No.	Rate	No.	Rate
90-95	Heart disease	1	145	1	228
45-53	Cancer	2	100	2	102
158-161	Diseases of early infancy	3	69	8	41
96, 97, 99, 102	Diseases of the arteries	4	65	10	20
23-32	Tuberculosis	5	63	7	60
107-109	Pneumonia	6	61	6	69
163-198	Violent deaths	7	58	3	98
130-132	Nephritis	8	52	5	83
11	Influenza	9	38	9	26
119-120	Diarrhoea and enteritis	10	32	12	17
82	Cerebral hemorrhage, etc.	11	30	4	84
121	Appendicitis	12	14	13	14
59	Diabetes mellitus	13	12	11	21

According to the statistics available to me, the death rate from all causes per 1,000 population in the Canadian registration area in 1923 was 10.6. In 1933 the rate was 9.1. For the same years in the United States registration area the figures were 12.2 in 1923, and 10.7 in 1933.

The rate for deaths under one year per 1,000 births in the Canadian registration area in 1923 was 88 per 1,000 births; in 1933 it was 62. With us the rate was 77 in 1923 and 58 in 1933. Maternal mortality for the Canadian registration area was 5.4 per 1,000 births in 1923 and 5.0 in 1933. In the United States in 1923 the rate was 6.7 and in 1933, 6.2.

Your birth rate in 1923 was 24 per 1,000 population; in 1933 it had declined to 19. For the United States the rate in 1923 was 22, while in 1933 it was 16. You apparently still have the advantage over us in the factor of

national increase in population. Of course, thanks to a hardy stock, your Doctor A. R. Dafoe, and the action of the Dominion Government, we can offer you no competition in the matter of multiple births!

The collection of statistics relating to births, deaths, and the prevalence of disease has made rapid progress during the past fifty years, particularly the collection of information relating to deaths and the prevalence of disease. With the formation of the Canadian registration area in 1921 you made distinct progress in that field. After many years of effort, we have finally succeeded in getting every state in our country into both the death and birth registration areas. It is my understanding that all of your provinces are now in your registration area.

It is axiomatic that in preventing and controlling the spread of disease, prompt information is necessary in regard to the locality of occurrence of the disease and the conditions under which it is occurring. Modern means of transportation and the increase in the rate and amount of travel by rail, by automobile, and by airplane greatly facilitate the rapid dissemination of communicable diseases and emphasize the need for prompt information.

Several diseases have been mentioned in which satisfactory progress has been made in prevention and control. There are others, however, which have increased. Diabetes has shown an increase both in Canada and in the United States during the past 10 years, although the brilliant work of Banting and Best placed in the hands of the medical profession that most valuable agent for use in treating diabetes, insulin. Cancer, too, has continued to increase in both countries. Pneumonia is still important as a cause of death. These diseases continue as a challenge to us.

Not only are we still concerned with certain diseases that we have known for many years, but diseases hitherto seemingly unimportant have developed into problems of considerable dimensions. A widespread outbreak of epidemic encephalitis appeared in one of the larger cities of the United States in 1933. Subsequent studies made by the Public Health Service in various sections of the United States have shown that the presence of the virus of this disease is by no means unusual, and no doubt many cases occur without being recognized clinically.

The dread spectre of infantile paralysis still stalks through the land to confuse us. Let us hope that the near future will bring us means more successfully to combat this arch enemy whose attack leaves us crippled and deformed.

Psittacosis, undulant fever, tularaemia, and other diseases rise to prey upon us, but we have learned how to fight them.

The importance of industrial hygiene from a health standpoint has increased immeasurably within recent years. New problems are constantly arising with the development of new industrial processes. Although occupational diseases have been recognized since ancient times, the field of industrial hygiene is becoming constantly more important and more complicated.

We have witnessed decided advances in mental hygiene and a fuller recognition of the tremendous importance of this now well-defined branch of medical science within the past few years. Institutions and colonies for the care of

those mentally sick, epileptics, and the feeble-minded have become a necessary part of the public facilities provided by the provinces and states of our respective countries. The scope of the field of mental hygiene is so great that it is difficult to enumerate its ramifications. The Public Health Service has just opened at Lexington, Kentucky, an institution with a capacity of 1,000 beds, the purpose of which is to develop methods for the rehabilitation of persons addicted to the use of narcotic drugs. It will be used primarily for the care and treatment of Federal prisoners who are narcotic addicts. A second institution is now under construction at Fort Worth, Texas. We are looking forward with intense interest to progress that may be made in connection with the treatment of drug addicts at these institutions. In studying drug addiction from a public health and medical standpoint, we have had occasion to note with gratification the excellent approach that has been made to the problem in certain provinces of Canada.

I have endeavoured to show that while we have made great progress in the control and prevention of some diseases we still have others confronting us in which little or no progress has been made. New health problems are constantly arising. If we are completely to fulfill our duty as public health workers, we must make efforts to adjust ourselves to new and changing conditions, and be able to meet new questions that arise. In order to accomplish this, we must intensify our efforts at scientific research; we must to a greater extent apply the knowledge we now have to the solution of many of our health problems; and we must labour unceasingly to do the day's work to the best of our ability.

Within the last decade or so there has grown among our peoples a new conception of the duties, responsibilities and functions of government, a doctrine which involves the increasing subordination of the rights and privileges of the individual to the determined benefits of the group. It is well for us as members of the medical and allied professions to recognize that this change of attitude is not directed solely toward matters of health, but we cannot escape being affected by this great movement, whether we as individuals or a profession think it good or bad.

While we have often been discouraged by the apparently slow progress in educating our public in matters of public health, there nevertheless has been a dissemination of knowledge that even in the traditional field of public health endeavour little progress has been made against venereal diseases, that our infant mortality rate should be halved, that our maternal death rate is disconcertingly high, that because of our lowering birth rate and lengthened longevity we are an aging population, and that the problems of adult health are increasing in importance. The field of public health is broadened, the emphasis is shifting from accomplished environmental sanitation to personal hygiene and care. The people are aware of the great store of medical knowledge and the benefits which would follow if they were available for all. It is common knowledge that despite the self-abnegation, altruism and devotion of our profession a large proportion of our peoples do not, and cannot, under our traditional relationships of doctor and public receive the benefits of this know-

ledge. The economic depression with its consequent necessity for governmental aid in relief along other lines has focused attention upon this defect in our social relationships.

As a consequence we as public health workers, both official and non-official, and as a part of the medical profession, are confronted with the problems of correct diagnosis and finding a solution. Many remedies are being suggested, some quack, and founded, I apprehend, upon a desire to introduce methods foreign to our form of governments, others which, while they are fairly effective, perhaps, in other countries, are not suitable under our traditions and conditions.

There are now before our respective legislative bodies, Federal, Provincial and State, various proposed pieces of legislation for the purpose of remedying this situation. This is not the time nor place to discuss the various methods proposed, and frankly I do not believe that there is any one method either in force in other countries or any which may be devised by us which can be made suitable to the many different racial, economic and social conditions which exist in my own country. We shall, I think, while taking advantage of the light of experience elsewhere, have to adopt methods suitable for particular conditions and areas. There are, however, certain fundamental principles from which we should not depart.

In the first place, while recognizing that the science of medicine, including as it does the whole field of knowledge, can no longer be restricted within the confines of the medical profession, and that the biochemist, the sociologist, the sanitary engineer, and the laboratory technician must necessarily be included in public health, and indeed with curative medicine itself; and while recognizing that within the field of private practice and curative medicine the physician is often no longer capable alone of diagnosing and treating the patient but must of necessity rely upon non-medical assistance, I am conservative enough to believe that we should adopt no methods which would remove the personal relationship between physician and patient, which in my opinion cannot be replaced by the relationship between the impersonal clinic and the individual. Diagnosis has not yet reached the stage where all of it can be done mechanically, and the physician still needs to know more about his patient than may be revealed by chemistry or physics; nor do I believe it would be wise, in the light of experience in other countries, to combine medical relief with unemployment or other insurance plans.

I am quite confident that, in both your country and ours, the medical profession should make every effort to propose and devise sound solutions which will be in the public interest, and it is an encouraging thing that to-day groups within our profession and in other fields of activity are seriously studying the problem and experimenting with various potential solutions. I am quite sure that from this experience we may gradually develop a proper and efficient relationship among public health authorities, private practitioners and the public to be served.

Tuberculin, Johnin and Mallein derived from Non-protein Media*

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IN general, laboratory culture media used for the propagation and study of bacteria may be classed either as media in which animal and vegetable matter serve as the basis of the nutrient elements required or media in which all the ingredients are chemicals of known composition and purity. Without going far into bacterial biochemistry, it is sufficient and obvious to remark that a medium of definite chemical composition which can be prepared and repeated at will according to an exact chemical formula offers advantages for certain kinds of work and special purposes which ordinary nutrient media of variable and uncertain composition do not possess.

In ordinary nutrient media as generally used for most bacteriological purposes, the protein and nitrogenous matter required for bacterial growth is furnished, as a rule, by meat, peptone, blood serum, egg, etc. In the so-called synthetic culture media protein is entirely absent, the source of nitrogen and amino-acid coming from certain chemical compounds, one of the most suitable and frequently used being asparagin. Many formulae have been given for the preparation of synthetic culture media, the constituents of which, for the most part, are asparagin, glycerin, the salts of potassium, magnesium, sodium and ammonium. As well known examples, the formulae of Sauton, Proskauer and Beck, Long and Seibert, Dorset and Henley, are given in the following table.

TABLE I

FORMULAE OF SYNTHETIC CULTURE MEDIA

	Dorset and Henley	Sauton	Long and Seibert	Proskauer and Beck
Asparagin	12.0	4.0	5.0	5.0
Dipotassium phosphate (dibasic, K_2HPO_4)	1.8	0.5	....	....
Potassium acid phosphate (monobasic, KH_2PO_4)	....	....	3.0	2.0
Magnesium sulphate	1.5	0.5	1.0	0.6
Acid citric	....	2.0	....	....
Ammonium citrate	....	....	5.0	....
Sodium citrate	0.9	....	....	....
Magnesium citrate	....	....	....	2.5
Sodium chloride	....	....	2.0	....
Sodium carbonate (anhyd.)	....	....	3.0	....
Ferric ammonium citrate	0.3	0.05	0.05	....
Dextrose (glucose)	10.0	....	....	....
Glycerin	100.0	60.0	50.0	20.0
Water *q.s.*	1000.0	1000.0	1000.0	1000.0
	No adjustment of pH	Adjust with pure ammonia to pH 7.2	No adjustment of pH	

*Presented at the Christmas meeting of the Laboratory Section, Canadian Public Health Association, Toronto, December, 1934.

The constituents of these vary but little in kind and mainly in the relative proportions of each. All include asparagin, glycerin, either monobasic or dibasic potassium phosphate, magnesium sulphate, and a citrate. The formula of Dorset and Henley has the important addition of dextrose.

Until quite recent years, neither these nor any other synthetic culture media have been used to any great extent in the manufacture of biological products.

I. TUBERCULIN

Sauton's synthetic medium was recommended by Calmette for the propagation of the attenuated tubercle bacillus, "BCG", and is largely used in the preparation of BCG vaccine. Long and Seibert used their non-protein medium in their studies of "the chemical composition of the active principle of tuberculin", and for the production of tuberculin in large quantity.

Dorset (1933) has described a synthetic medium, developed by Henley, for tuberculin production, which differs from those previously mentioned mainly in the increased content of asparagin and glycerin and the addition of dextrose, and concludes that the tuberculin obtained with this medium is not only a pure product, from a chemical standpoint, but also more potent and reliable than the old glycerinated-broth tuberculin.

Glover (1933) has studied the reactions of cattle to "Old Tuberculin" and synthetic tuberculin prepared on Long's medium, and concludes that the synthetic product was as active as "O.T." and less apt to cause non-specific reactions.

Our own experience in growing "BCG" and strains of *B. tuberculosis* in Sauton's medium led us in 1930 to experiment with this and other synthetic media for the production of tuberculin and johnin and to study the potency of the products so obtained in comparison with those derived from the same strains in the usual broth cultures. It was soon observed that a much more abundant growth of tubercle bacilli was obtained in the synthetic media than in the glycerinated broth media. The formula of the synthetic media has been slightly modified by my associate worker, Dr. J. C. Reid, the constituents being as follows:

Asparagin	5.0	grams
Potassium acid phosphate (monobasic)	2.0	"
Magnesium sulphate	1.0	"
Ammonium citrate	2.0	"
Sodium chloride	2.0	"
Ferric ammonium citrate	0.075	"
Dextrose	10.0	"
Glycerin	60.0	"
Water to make	1000.0	cc.

Adjusted with ammonia to pH 7.2—7.4

In lots of 50 litres or more (2 litres in each flask) this medium has yielded an average of 10 - 12 grams of bovine tubercle bacilli, *dry weight*, per litre; and, in some instances, as much as 13-14 grams per litre. Using the same strains

of tubercle bacilli, the usual glycerinated-broth media have yielded an average of 6 - 8 grams per litre.

Dorset mentions a high yield of 2 grams of bacilli per 100 cc. of culture fluid (or 20 grams per litre). This may be due to the larger amount of asparagin and glycerin in Dorset's medium or to the different bacillary strains used, the human type, as a rule, giving more luxuriant growths than the bovine.

We have made comparative tests of tuberculin obtained from the culture filtrates of our synthetic media (S.M.T.) and tuberculin prepared from glycerinated broth cultures (K.O.T.) by the following methods:

(1) *Skin Tests on Guinea Pigs*

In one series of 10 guinea pigs, 4 to 5 weeks after inoculation of virulent tubercle bacilli, intradermal injections were made at corresponding sites on either side of the body. Estimating the degree and intensity of reactions by caliper measurements of the total area involved, redness, oedema and infiltration, and indicating the same by figures or plus signs, the average reaction to S.M.T., as compared with K.O.T., was 50 and 40 respectively, and led to necrosis in 7 reactions to the former and 2 to the latter.

(2) *Lethal Tests on Guinea Pigs*

The lethal effect of these tuberculins by intraperitoneal injection into sensitized guinea pigs was higher for S.M.T. than for K.O.T. in corresponding doses, being 66 per cent with the former and 50 per cent with the latter.

(3) *Titration by Serological Methods*

In the presence of specific anti-tuberculous serum, complete complement-fixation occurred with S.M.T. in dilutions up to 1:3000 and with K.O.T. in dilutions up to 1:2000. The indices thus obtained:

Skin tests on sensitized guinea pigs	S.M.T. 50	: K.O.T. 40
Lethal tests on sensitized guinea pigs	S.M.T. 66	: K.O.T. 50
Complement fixation titration	S.M.T. 3000	: K.O.T. 2000

point to a higher potency of the synthetic media tuberculin.

Comparative Tuberculin Tests on Cattle.—Intradermal tuberculin tests, as practised under field conditions, were applied to 12 animals in our experimental herd of tuberculous cattle, using S.M.T. and K.O.T. simultaneously, as indicated on page 272.

Eight of the tuberculous cattle were slaughtered immediately following completion of the tuberculin test and necropsies performed in order to ascertain if any co-relation was apparent between the degree of infection and extent of tuberculous lesion and the intensity of the tuberculin reaction.

Two of the cattle (nos. 147 and 251) found with only slight lesions, gave 4+ and 3+ reactions to S.M.T. and only 1+ and a questionable reaction to K.O.T. Two cattle (nos. 149 and 223), with extensive lesions and in an ad-

vanced stage of the disease, gave 2+ and 3+ reactions to S.M.T. as compared with 1+ reactions to K.O.T. The four remaining cattle, although extensively diseased, gave weak and similar reactions, 1+ and questionable, to S.M.T. and K.O.T., respectively.

Animal No.		S.M.T.	K.O.T.	Tuberculous lesions at necropsy
147	Tuberculous.....	+++	?	Slight
159	Tuberculous.....	+	+	Extensive
149	Tuberculous.....	++	+	Extensive
146	Tuberculous.....	?	?	Extensive
216	Tuberculous.....	+	+	Extensive
223	Tuberculous.....	+++	+	Extensive
249	Tuberculous.....	?	?	Extensive
251	Tuberculous.....	++++	+	Slight
190	Tuberculous.....	+++	+++	
171	Tuberculous.....	++	+	
181	Tuberculous.....	+++	+++	
239	Tuberculous.....	+++	+++	
264	Healthy control....	−	−	
314	Healthy control....	−	−	
291	Healthy control....	−	−	
297	Healthy control....	−	?	

It is well known, of course, that sensitivity to tuberculin may disappear in far advanced generalized cases of tuberculosis. Eliminating such cases, there are indications that this new or special tuberculin (S.M.T.) is in no way inferior or less satisfactory than ordinary tuberculin (K.O.T.), and that, on the contrary, it does possess a higher potency and superiority as a diagnostic agent. This tuberculin, prepared in our laboratory by Dr. J. C. Reid, has been applied to many thousands of cattle tested under tuberculosis-eradication policies and is now in general use.

II. JOHNIN

Johne's disease, or paratubercular enteritis, is an infectious chronic disease of cattle caused by an acid-fast bacillus named after its discoverer, Johne. The disease causes serious losses; and the infection, for the most part, like tuberculous infection, is slow and insidious and can rarely be diagnosed, except in far advanced cases, by its clinical manifestations. Johnin is used as a diagnostic agent in a similar manner to tuberculin and is obtained from culture filtrates of Johne's bacillus. Laboratory workers who have attempted to cultivate this organism are familiar with its vagaries in growth and the difficulties in propagating it. It has been the invariable custom to add to the culture media, no matter what kind is chosen, the grass or timothy hay bacillus, *B. phlei,* or its extracts, as first recommended by Twort and Ingram, and supposed to contain some "essential substance" necessary for the growth of Johne's bacillus under laboratory conditions.

Boquet, substituting Sauton's synthetic medium for the various complex nutrient media, and adding 10 per cent of a glycerinated extract of *B. phlei,* obtained growth in abundance, but less when the phlei extract was reduced to 5 per cent, and scarcely any growth at all in a dilution of 1 per cent. Boquet discusses at length the nature and properties of this "essential substance" obtained from acid fast bacteria, and suggests that it acts as a catalyzer but admits that its exact nature and function remain unknown.

Dunkin has reported his attempts to cultivate Johne's bacillus on synthetic medium without the addition of *B. phlei.* Only very feeble growths, covering less than one half the surface area of the medium, were obtained.

FIGURE I.
JOHNE'S BACILLUS
Eight-weeks'-old growth in synthetic medium (without the addition of *B. phlei* or any so-called "essential substance").

In 1928 we commenced a study of culture medium requirements and conditions for the growth of Johne's bacillus. Strains were first carried on solid nutrient media, such as egg, agar, potato, etc., containing *B. phlei* or extracts of this organism and then from selected cultures transplanted to Long's synthetic medium containing *B. phlei.* The next step in acclimatizing the strains of Johne's bacillus to media containing no *B. phlei* or other acid fast bacteria, or their extracts, was cultivation on potato slants and cubes partially immersed in synthetic medium. From cultures obtained in this manner transplants were made to the synthetic medium alone, that is without *B. phlei* or potato, and this, in subsequent sub-cultures since 1930, has given us more or less abundant growth. The optimum pH of the synthetic medium is 5.6 - 5.8. Five strains of Johne's bacillus have been propagated in this manner, two of which are yielding from 12 - 14 grams of bacilli per litre of medium, and the others from 5 - 10 grams per litre, *dry weight.*

In about one month the surface of the medium is covered with a rich growth. This either falls to the bottom from its own weight or by gentle agitation; and two or three subsequent surface growths are developed in the same manner, exhaustion of the medium and maximum growth being reached in 10 to 12 weeks.

We have thus been able to produce massive cultures of our five laboratory strains of Johne's bacillus in the synthetic medium of Long and Seibert, entirely omitting *B. phlei* and its extracts. Rich growths are also being produced in a modified Sauton's medium (J. C. Reid) without phlei. It is thus clearly shown that the so-called "essential substance" is not necessarily a nutritional factor or growth requirement, and that it can be omitted with advantage in the production of johnin.

It is generally conceded that johnin in its practical application as a diagnostic agent is not as reliable and indicative for Johne's disease as is tuberculin similarly used for the detection of tuberculous infection. This may be due in part at least to the paucity of growth in the culture media hitherto habitually employed and a consequently feeble strength or potency of the johnin produced therein. Unfortunately no satisfactory method has as yet been evolved for titrating johnin and definitely ascertaining its potency. But it is reasonable to assume that potency is largely dependent upon the amount of growth of the bacillus and its exogenous products in a given quantity of the fluid medium, and that with the heavy luxurious growths now obtained in the pure synthetic media we have a more pure, specific and potent johnin.

It has taken about five years to "educate" these strains of Johne's bacilli to give such luxurious growth in a chemically pure non-protein media. The credit for this work is due to Miss E. A. Smith, 1928-30, and to Dr. H. Konst, 1931-34.

It may be asked whether there is a possibility that these "educated" strains have lost their capacity to elaborate johnin. To answer this question, and whether one strain is more capable than another of producing johnin, it will be necessary to test the product upon large numbers of infected cattle. Attempts to sensitize laboratory animals have so far failed, and no reliable laboratory test has as yet been evolved.

III. MALLEIN

Having succeeded in producing in a non-protein synthetic medium tuberculin of very high potency, and johnin, we turned our attention to mallein: a product of *B. mallei* obtainable from the filtrate of broth cultures extensively used for the diagnosis of glanders infection. Mallein, besides causing characteristic reactions in glandered animals, is apt to give in unusually sensitive animals pseudo or non-specific reactions differing from the former only in degree and in time, but making it possible to come to faulty decisions or necessary to hold many animals as suspicious reactors. Horses, we believe, are more sensitive to foreign proteins than are cattle. We have proved, moreover, that horses can be highly sensitized by injections of mallein repeated at short in-

tervals, and immunized with this product by increasingly high dosage. Our object, therefore, was to produce a mallein in a protein-free synthetic medium which would prove to be a more potent and specific reagent than mallein as hitherto obtained from ordinary broth media.

We have had no difficulty in obtaining an abundant growth of *B. mallei* in our synthetic culture media equal or superior to that obtained in ordinary broth media. Mallein from this media, prepared by Dr. J. C. Reid, has been tested on a small number of horses experimentally inoculated with *B. mallei*, and on normal horses, by the subcutaneous and intrapalpebral methods, the latter being done simultaneously with mallein produced in the usual way from broth cultures, using one eye for the new type of mallein and the other for the old product. The results have been satisfactory and very encouraging, but our limited experience does not permit us to say definitely at present that the synthetically produced mallein is superior and overcomes the objections mentioned, although pointing in that direction.

DISCUSSION

This brief presentation, without protocols of experiments and trials, is mainly to suggest advantages which a non-protein synthetic culture media may have over the commonly used nutrient broth media in the development of biological products, especially those intended or destined for use in allergic tests. It is possible, even probable, that the advantages and preferences will not stop there but will be brought out in connection with bacterins and other bacterial derivatives now so extensively used for diagnostic tests and therapeutic purposes and as antigens for the production of immune or anti-sera. For whatever purpose employed, the nearer the reagent comes to chemical purity and definition, the more specific is likely to be the reaction to it and the greater possibility of gauging and interpreting it correctly.

As regards tuberculin, the comparative analysis given by Dorset of the culture filtrates of broth medium and synthetic medium, showing a protein content of 1.40 per cent in the former and only 0.32 per cent in the latter, is quite suggestive. Although the protein content in the synthetic medium is less than one-quarter of that in the broth medium, it is derived solely from the tubercle bacilli and is far more potent than the combined bacterial and foreign proteins in the broth media, as well as being free from other impurities.

Factors which may, or certainly do, play an important role in altered cellular reactivity and in the mechanism, development and manifestation of allergy, hypersensibility and immunity are, for the most part, very imperfectly known and understood. Unaccountable and inexplicable reaction phenomena occur not infrequently, and specific reactions which are to be anticipated may not occur or are confused and obscured with other associated reactions.

If the bacterial protein-antigen used to produce a specific antibody or immune serum is mixed or combined with foreign proteins present in commonly used culture media, it is to be expected that the immune serum produced will

contain both specific and non-specific antibodies and react not only with the specific antigen but with its associated antigenic substances as well. Similarly, it may be assumed that the body cells may have a natural or induced sensitivity to the proteins present in nutrient culture media and, if these are embodied with the specific allergens, will more or less react to them and tend to complicate, obscure or falsify a true allergic response. Moreover, certain individuals, human and animal, are more or less highly sensitive to multiple proteins and allergens, and as such are apt to give non-specific reactions when submitted to an allergic test. This is true in regard to such products as tuberculin, johnin and mallein. Theoretically, at least, it is desirable that specific protein antigens and allergens be unadulterated with any foreign protein matter and prepared in as pure a form as is practically possible. The use of "synthetic culture media" as a substitute for the commonly used "nutrient broth media" appears to be a forward step in this direction.

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The Problem of Fish As Food*

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ALTHOUGH it is always rather unsafe to generalize, it seems quite definite that there is no subject of such great importance for health as that of the substances which we take as food, since they are often the primary and sometimes the unrecognized causes of disease. Everybody has a very considerable experience with food and very many speak about it with the greatest of confidence in their knowledge, and yet there seems to be no matter connected with health of which we are still so supremely ignorant as we are of the nature of foods and of the ways in which they may bring about disease. While still, like primitive man, depending largely upon empiricism, we are, I hope, emerging from the sophomore stage, in which a little knowledge makes us so foolishly wise as to consider that proteins, fats, carbohydrates, water, salts and calories comprise dietetics. Although our horizon has been extended by the conception of such relatively novel substances as vitamins, we should realize that we are still only on the threshold of knowledge.

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The reason for this state of affairs is the enormous complexity of the subject. The old saw, "What is one man's meat is another man's poison," shows an appreciation of the differences between individuals as reflected in food requirements. Scarcely any two human individuals start out in life as fertilized eggs with quite the same physico-chemical constitution, and each one is continually altered by the experiences which he undergoes. On the other hand, the substances he takes as food come from individuals of a great variety of species of living organisms, each of which is almost equally complicated and as individually variable as man. It must be remembered also that medicines and poisons have been arbitrarily separated from foods and that, in the broad sense, food includes them all, everything that is taken into the alimentary or food canal. Fortunately, with food as with education the individual somehow survives a most extraordinarily wide range in the things with which he may be presented. If, however, we are to attain definite objectives, as in public health, that is, if we are to demand more than mere survival of the individual, the knowledge necessary for rational dietetics must come.

The prime necessity of food, not only for keeping the individual alive and functioning, but for the growth of new generations, made Malthus somewhat over a century ago consider it as the governing factor for the size of the population of a country. While it is definitely one of the governing factors in such Asiatic countries as Russia, India and China, it is thought that in Canada, at least in its well settled portions, provided with modern facilities in transportation, the lack of food has practically been eliminated as limiting the number of people. We are in the somewhat curious position of being urged to eat more of this food or of that food on a certain day, or during a certain week, and the driving force behind these campaigns is the need of the people, who produce the food and have too much, to exchange their surplus for the various amenities of life. Food becomes a limiting factor in a new way, not as such, but as a source of livelihood through exchange in world markets. For example, Jenness, in a recent article entitled "Canada's Fisheries and Fishery Population,"* maintains that there is a very definite limitation to the population that the fishing industry of Canada can support—perhaps employment of 100,000, giving a means of livelihood to half a million.

We are not concerned on this occasion with the problem that fish for food presents as a source of livelihood to those in the industry, but rather with the problem of providing fish of such kinds or in such condition as the public desires or should have. Presented with a surplus of food the people pick and choose, taking what they fancy, what is less costly, and what is good for the health. Of these three reasons for choice, the first is all important, and the last is not far from being negligible in comparison with the others, except for the sick. The health factor, however, frequently turns the scales when the balance otherwise is fairly even, and it may be very effective in slowly determining taste or fancy. Unfortunately, the very many facts of experience with foods present such a maze that there is very little agreement as to the

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proper path or paths to take in order to attain and retain good health. We are overwhelmed with many kinds of conflicting advice. Yet on the whole the people of this continent have been moving rather steadily in the direction of having food fresher and more varied, as being of importance for health. Such a course seems universally accepted as the safe one.

The strongest arguments for variety in food have come from knowledge of the so-called "deficiency" diseases. It has come to be generally realized that the proper functioning of the body depends upon the presence in the food of an unknown number of organic and inorganic substances, present perhaps in such minute quantities as to defy detection, except by their effects on health. From very ancient times fish have played an important role in furnishing the necessary variety, particularly fish from the sea, whither nearly every substance tends to be carried by drainage from the land. In the broad sense, everything from the water is a fish, even the gathering of the seaweed, dulse, being called a fishery, and the harvest included in the fishery statistics.

By virtue of its responsibilities under the Minister of Fisheries, the Biological Board of Canada has the duty of investigating problems connected with the use of fish as food, and maintains a laboratory on each of the two coasts of the Dominion for the study of the problems that arise in the handling of fish. This work has been developed during the last ten years in response to the demands of those engaged in the fish industry. There is a very great variety in the methods used in the handling of fish because of the great diversity of sea products that are taken for food, and of the widely differing demands of the markets of the world to which these products go. The demand for assistance has come principally from the part of the industry that attempts to cater to the changing food demands of the people of this continent, and that is frequently referred to as the fresh-fish trade. Actually in this trade the fish are treated in a great variety of ways. Some few, such as lobsters, oysters, and clams, may be kept alive until they reach at least the cook, if not the table. The great majority, however, cannot be kept alive and at the same time are readily damaged when removed from their supporting medium, the water, and quickly decompose. To supply such ocean fish regularly in a fresh, or approximately fresh condition, throughout a continent three thousand miles wide has been a particularly difficult problem. Icing, freezing and limited amounts of salting, drying and smoking are used to meet this situation. Nevertheless, while remaining in an approximately fresh condition, the product is always decidedly perishable.

Variable as this food is in its original state, as has been already mentioned, much additional variety results from (1) the series of changes taking place in autolytic decomposition which begins when the tissue dies, (2) the very many changes of varied type concomitant to the growth of the many kinds of bacteria that may gain access to the tissues of the fish either separately or in combination, and (3) changes effected by the very methods that are used to prevent undesirable bacterial decomposition.

By no conceivable method can the fish be kept without any change whatsoever in the state that immediately follows death, and that is the ideal in

freshness. The automatic changes that ensue may be slowed down by lowering the temperature, that is by icing, but in a few days—the number depending upon individual taste—these changes produce undesirable substances. There are possibilities, not yet sufficiently explored, of holding the fish satisfactorily for considerably longer periods by reducing the temperature well below that of icing, and in fact freezing the fish, but not permitting the temperature to drop below a certain critical point in the neighbourhood of −5°C., in order that the changes in freezing will be reversible on thawing. In present practice, however, when icing does not permit the fish being kept long enough in a satisfactory condition, recourse is had to freezing and storage at as low temperatures as are economically feasible. Only in this way can fish be provided steadily in an essentially fresh condition to markets throughout the continent. While this method is quite effective in stopping autolytic and bacterial decomposition and in thus permitting the fish to be kept for many months in a satisfactory condition, a new series of changes proceeds, though slowly, and may reach undesirable lengths if the fish is kept too long at a temperature not sufficiently low.

Microorganisms of somewhat different character from those occurring at ordinary temperatures may live and multiply on and in the fish during cold storage, if the temperature is not very low, and their effects will be various. At the surface of the fish, the air slowly brings about oxidative changes, which in the case of the fats decidedly alter the flavour and even the colour. At the surface also there may be drying through sublimation of the ice. Apart from these changes, there is a progressive change in the substance of the fish, which makes it less able, on thawing, to take up again the water which was separated from it in freezing.

In the fresh-fish trade there is little use of salt alone as a means of keeping the fish in a fresh condition. A small amount may be used on the surface, e.g. of fillets, to inhibit the bacterial changes that proceed so rapidly. Apart from this, the salt will act on the superficial part of the fish, somewhat altering its character. The salt itself, though largely sodium chloride, varies in composition. The deliberate use of drying is only in connection with smoking.

The smoking process used by the fresh-fish trade in making finnan haddie, smoked fillets, etc., is aimed at making a very perishable product somewhat less perishable, adding an agreeable flavour, and yet not changing the fish from the fresh condition any more than is unavoidable. It is far from being the mere application of smoke. In order to change the superficial part of the fish into a tough, smooth, shining skin or pellicle, which will protect the relatively little altered interior, autolysis must be permitted to proceed a certain distance, and the surface is quickly acted upon by strong brine at a low temperature and then rapidly dried in a current of air not warmer than 90°F. Only after this treatment is it proper to apply smoke. The smoke used is extremely variable in composition, depending on the wood used, the temperature of combustion, and the amount of air. It contains many constituents and its composition is imperfectly known. Long usage has legitimized the smoking of foods and even the inhalation of smoke, in spite of the fact that smoke is

known to contain definitely deleterious substances. The question when these are in sufficient concentration or have acted for a sufficiently long time to produce definitely harmful results is a matter of dispute. It is interesting in this connection to note that formaldehyde, legally condemned as a food preservative after a long, but inconclusive investigation by a pure food enthusiast, seems to be the principal constituent of smoke to make effective the application of the latter to fish. At the Atlantic Fisheries Experimental Station of the Biological Board, Dr. J. A. Dauphinee found it to be a very definite constituent of the smoke used in treating fish. Dr. E. Hess determined its effectiveness in keeping down bacterial decomposition, and Dr. J. C. Forbes was able to show not only that it made the fish firm enough to stand very considerable handling without having the protective pellicle broken, but it also helped to give the desired flavour and colour. At McGill University, Dr. S. A. Beatty compared the results of feeding rats on ordinary smoked fish and fish treated with sufficient formaldehyde to give a definite odour, but he failed to get any clear indication that growth was adversely affected.

It should be realized that formaldehyde acts on almost all forms of organic matter, disappearing in so doing, and can perhaps never enter the body proper unaltered. The real problem in connection with its use seems to be what role the methylene protein derivatives, which it forms, play in the body. Further, formaldehyde is only one of the many constituents of smoke.

Although there is an almost infinite variety in the substances into which the fish material may change under the varied treatment to which it may be exposed, for the most part the changes are those of decomposition, resulting in the formation of simpler compounds. Such changes are practically irreversible. Consequently, the farther these changes have progressed, the fewer are the possibilities that still remain and the less valuable is the fish.

Under Dr. B. P. Babkin of McGill University a beginning has been made at the Atlantic Biological Station in determining the action of different fish materials when taken as food. Dr. S. A. Komarov found that haddock flesh when taken as food produced as great and as active a gastric secretion as did beef, while haddock skin produced about fifty per cent of a more acid gastric secretion and one quite as active in digestion. Miss A. Alley found that lobster was more effective than haddock and similar fishes in causing gastric secretion. She also found that haddock when baked produced a gastric secretion with more pepsin and mucin than when it was boiled, fried or salted. Mr. J. Campbell has attempted a separation of the constituents of some of the foods in order to find possible explanations of differences in their food value. Lobster proved to have a much higher proportion of non-protein nitrogen than cod, haddock, salmon or herring, and this seems due to larger amounts of mono-amino-acids and of substances such as histidine and arginine.

Whatever may be revealed by future investigations as to the desirability or undesirability of the changes brought about in fish by particular treatment, the importance of the ability to keep fish fresh will remain. Also at the present time only by its being kept really fresh can it be hoped that fish will take the place in the diet of the people of this continent to which its qualities entitle

it and which the needs of health demand that it take. The fish that is so frequently prescribed in the diet of convalescents or of those with digestive disturbances is not the highly flavoured article that results from decomposition, or from treatment by salt, smoke or similar preservatives, but rather the delicately flavoured, perfectly fresh fish, preferably of kinds with very little oil or fat. Again it is the latter alone that the healthy person is able to eat regularly and in quantity, without tiring of it. Methods of keeping fish fresh should, therefore, receive chief attention from those concerned with the supplying of fish to the people of this continent.

That practice in providing fish fresh falls so far short of the ideal is not because the principles of successful practice are unknown. There are exceptional difficulties to be overcome. To a large extent fish must be taken when and in the quantity in which they happen to be available. Capture in most cases involves their death, and they must be handled very carefully to avoid mechanical injury which accelerates decomposition, and this under the best conditions is quite rapid. Nevertheless, it has been repeatedly demonstrated that, with proper handling, fish can be kept quite fresh for months, which permits them to be available at any time almost anywhere on the continent in spite of the fact that they are taken at irregular periods in very distant localities, often many miles off the coast.

The principles are simple: to lower the temperature of the fish as soon after death as possible and as rapidly as possible to approximately zero Fahrenheit, to keep them at that temperature until shortly before use, and to protect the surface from the action of air. While there is the possibility of many improvements in particular procedure for particular kinds of fish, the problem at the present time is largely one of industrial management. Multiple control of the varied handling from the water to the consumer is practically universal and there is no *one person* or *one body* to ensure that the handling throughout is what it should be to place the blame when anything goes wrong. At the present time almost invariably something does go more or less wrong at one or more stages in the handling and really fresh fish is still for most people the rarity that the meaning given to "fishy odour" proclaims it to be. That odour definitely does not come from fresh fish. This state of affairs can be corrected in my opinion only by unified control exerted in the unremitting application of rigid inspection to all essential stages from water to consumer.

Epidermophytosis

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THE general impression that "athlete's foot" (ringworm of the feet) is a skin disease contracted at swimming pools has become a popular fallacy of the first magnitude. The swimming pool has been so persistently linked with this affection in the commercial exploitation of proprietary antiseptics that the two are almost inseparably associated in the public mind, with the result that this popular delusion now constitutes a serious menace to the patronage of the modern public swimming bath. The general public has become so foot-conscious as a result of this widespread publicity, by radio and otherwise, that a simple condition, which in former years would have been regarded as an indication for more frequent use of soap and water, is now brought to the consulting room of the dermatologist.

Some years ago it was estimated that fully 50 per cent of our population was affected. Legge, Bonar and Templeton (1) reported that "during the physical examination conducted by the university [California] physician for 1928-29 it was found that the incidence among 3,100 freshman entrants was 53.3 per cent in men and 15.3 per cent in women, showing that the disease was common among high school and preparatory school students." In another survey "made of 1,000 men and 997 women . . . it was determined that 78.6 per cent of men students and 17.3 per cent of women students had clinical manifestations of ringworm of the feet." The findings were tabulated as follows: *slight involvement,* men 35.3 per cent, women 7.2 per cent; *definite involvement,* men 21.1 per cent, women 5.6 per cent; *moderately severe,* men 12.9 per cent, women 3.9 per cent; *severe,* men 8.3 per cent, women 0.6 per cent.

Gilman (2), of Philadelphia, says: "An examination of the diagnoses made in the dermatologic clinic of a student health service discloses an incidence similar to figures arrived at in dispensary and private practice . . . of 500 male students examined 297 (60 per cent) had gross evidence of ringworm . . . Clinically, the most outstanding symptom among these students was the occurrence of immoderate foot sweating—an incidence of 50 per cent over the non-infected group."

The popular belief, even in medical circles, that this disease is of post-war vintage is quite erroneous. The history of the affection doubtless dates from the time when civilization adopted the close-fitting, ill-ventilated leather shoe in preference to the sandal previously in general use. As early as 1870 Tilbury Fox (3), an English dermatologist, described the disease under the name "Dyshidrosis", it being his opinion that the cause was impeded function of the sweat glands of the feet. In 1884 Robinson (4) introduced the name "Pompholyx", owing to the presence of vesicles on the soles of the feet; and advanced the theory that it was of the nature of a herpes, of neurotic origin. In 1910 Sabouraud (5), of Paris, reported six cases, in four of which he

isolated the vegetable fungus *Epidermophyton inguinale,* the same organism that had been previously isolated in cases of eczema marginatum of the groin. He called attention to the fact that the skin folds between the fourth and fifth toes are most commonly involved. During the Great War the affection was very prevalent among the infantry troops. The widespread incidence of the affection was emphatically brought to the attention of the medical profession of America by the report of Ormsby and Mitchell (6) in 1916. These observers isolated the epidermophyton in a large number of cases and described its cultural morphology. More recently an organism of somewhat different morphology, the *Trichophyton interdigitale,* has been found to be more frequently involved in foot lesions; both being perhaps pleomorphic or cultural variations of the same organism.

In the modern conception of the term "epidermophytosis" the various intertrigos which are found to be associated with mycelial fungi are included. While the interspaces of the toes are most frequently involved, other moist intertriginous areas, such as the skin folds of the groin, mammary glands and axillae, are found to be frequently affected. In a broader use of the term, many of the eczemas which affect the glabrous skin, and which are also found to be associated with mycotic organisms of yeast-like morphology, are also included.

The fact that budding, yeast-like organisms (blastomycetes) are found to be generally associated with the dermatoses involving the more exposed portion of the skin, while the mycelial fungi (hypomycetes) are predominant in the more secluded intertrigos, is in itself significant, in view of the observation recorded by Osborne (7) that fourteen cultures of yeast-like organisms, isolated from different cases, were found to develop mycelia when grown under reduced oxygen supply. The recognized predilection of moulds for darkness also may have a bearing on the situation. It would thus seem possible that the various forms of moulds associated with the intertrigos, of which some twenty varieties have already been described, are all pleomorphic variations of the same basic yeast-like organism, due to differences in the natural mediums supplied in the different areas involved. Gammel (8), says: "Many fungi are subject to great variations. . . . Besides, how many fungus parasites live in nature is not known; only the form they assume after passage through the animal or human body is known. . . . It is not known whether the difference in colour, the pigment production and the formation of granules in cultures are constant features or individual variations due to dimensions of culture tubes, composition of mediums, water content, etc. Even the ability to ferment certain sugars may be lost or become acquired by the same organism."

The fact that these mycotic organisms and many strains of pyogenic bacteria have their natural habitat on the normal human skin is also significant. Jessner and Kleiner (9) recovered ninety strains of yeast-like organisms from 150 normal finger nails. It is of interest also that Williams (10) found *Trichophyton lacticolor* and *Epidermophyton cruris* on normal skins, and Cornbleet (11) has reported *Epidermophyton cruris* and *Microsporon audouini* in scrapings from between normal toes. The ubiquitous distribution of staphy-

lococci and streptococci on normal skin is well known. It would thus appear that, as with the pyogenic bacteria which cause acne and furunculosis when the right predisposition develops, so the mycotic organisms which constantly inhabit certain areas of the skin as saprophytes, may set up dermatoses under conditions favourable for their growth.

Hulsey and Jordan (12) found 23 strains of micrococci in 77 cases of clinical ringworm of the feet. White, as reported by Weidman (13), went farther by showing that at least 8 different strains of white coccus were represented in 24 colonies obtained from toe intertrigos which were free from fungi. Castellani, in 1919, stated that he often found streptococci in the "mango toe" of Ceylon and the "foot tetter" of China, both of which are regarded as being caused by the *Epidermophyton inguinale*. Incidentally, swimming pools can hardly be regarded as the means of contagion in Ceylon or China. In a survey of 272 cases of epidermophytosis reported by Weidman (13), from various parts of the United States and Canada, the incidence of the various organisms was as follows: *Trichophyton interdigitale* 140, *Epidermophyton inguinale* 54, unidentified 20, *Tr. rubrum* 17, *Tr. gypseum* 17, *Oidium albicans* 8, *Tr. asteroides* 3, *Tr. pedis* 3, *Tr. acuminatum* 2, *Tr. granulosum* 2, *Tr. plicatile* 1, *Tr. amethysticum* 1, *Tr. violaceum* 1, *Sporotrichum schenkii* 1,—total 272.

This multiplicity of associated micro-organisms suggests the question of the relative roles of the hyphomycetes and the bacteria in the etiology of epidermophytosis. Are the fungi saprophytic, and the pyogenic bacteria the active pathogenic agents, as claimed by Sabouraud; or vice versa? Or are both types essential to the clinical picture? On the face of the matter, the great plurality of organisms speaks strongly against any being specific.

Von Graffenried (14) was unable to inoculate patients experimentally with *Trichophyton pedis* unless he had produced maceration of the skin and maintained it for some time thereafter. White (15) reports 18 cases of epidermophytosis of the feet in which there was associated endarteritis obliterans. This circulatory impairment seemed to predispose to the dermatosis. Fischer (16) reports 10 cases of epidermophytosis in vesicular form on the chest in pneumonia cases that had been treated by hot applications. The vesicles were at first thought to be burns. Apparently the local injury of the skin predisposed to the mycotic development. There was no history of these patients having recently visited a public swimming pool. It is thus evident that some form of local impairment of tissue vitality is a necessary precursor to fungus invasion. This preliminary local devitalization can usually be attributed to faulty hygiene, local or general, which the writer claims is the basic cause of epidermophytosis, the multitude of micro-organisms playing a more or less secondary or saprophytic role.

DISCUSSION

The organisms found to be associated with "athlete's foot" belong to the mould subdivision of the fungi. Moulds grow best on decaying organic matter; in fact, the old English word "moulder" is synonymous with decay. The warmth, moisture and dead organic matter found in the interspaces of the toes, as con-

fined in the modern shoe, particularly the variety in general use by men, furnish ideal conditions for the growth of micro-organisms.

We wash our hands several times daily; but are we as kind to our feet? The average individual confines his feet in socks and shoes for fifteen hours per day, or a total of forty of the three score and ten allotted years of life. Socks are usually changed on the occasion of the weekly tub bath; but the same shoes are worn for six months or longer without any cleansing or disinfection. In fact, the lowly shoe is the only article of human attire that is not reconditioned hygienically. Is it any wonder that Nature shows her displeasure? The constant retention of perspiration, in the warmth and close confinement of the shoe, macerates and devitalizes the superficial layers of the skin on the inner surfaces of the toes and the plantar surface of the foot, providing the most suitable medium for the growth of the fungi. The presence of the trichophyton is not the cause of the devitalized skin between the toes, but is the natural sequence of this condition.

It is thus obvious that in order to contract the disease it is not necessary to "pick up" the spores of micro-organisms by contact, directly or indirectly, with some other person already affected, as the antiseptic vendors would have us believe. Micro-organisms capable of growing under these conditions are so widespread in nature that inoculation becomes automatic in the presence of suitable media and cultural conditions.

No positive evidence has yet been produced to prove that the disease is contagious. The earlier writers suggested the possibility of contagion at swimming pools, and subsequent writers have blindly copied this assumption, which the vendors of proprietory antiseptics have capitalized to their great advantage. Weidman (13) has been able to reproduce the affection in otherwise healthy interdigital skin folds by inoculating with the fungi and binding the digital members closely together with adhesive plaster for a lengthy period of time; but he has not eliminated the possibility of the disease developing under like conditions without artificial inoculation. As a control test an adjacent toe, which had not been inoculated, was bound up separately from the other toes; but this was obviously an unfair test, since the separately bound toe was not subject to the predisposing intertriginous action.

In an effort to determine the habitat of the trichophyton outside the body, Williams (17) reports that "approximately 1500 cultures were made, one half of which were from student lockers. Razor blades, which were flamed each time, were used in making the scrapings. Floors, machines, shells, benches, sills, mats, gymnasia apparatus, showers, etc., were cultured. Several cultures were made of sock washings, beach sand, beard hair and scalp hair . . . . Two suspicious colonies were obtained, one from a locker, and one from a machine foot rest." He failed, however, to obtain sufficient differentiation to prove that the organisms were either *Trichophyton interdigitale* or *Epidermophyton inguinale*. Many white mycelial colonies, which might well have been pleomorphic forms of these organisms, were noted; and he concluded that this might be the form in which the organisms occur in nature.

It is a very significant fact that the incidence of the disease is much less

in women and children than in men. Children seldom are affected, because they have not worn shoes long enough; they bathe more frequently, and wear sandals or light shoes in summer. Arnold suggests that "the spaces between the toes are dry in children until shoes are worn, but when feet are encased, these spaces are constantly moist, and the corneal layers of skin, which are being constantly shed in the presence of bacteria, result in a cheese-making laboratory,—the skin scales taking the place of casein. The odour will vary with the types of bacteria thriving on this alkaline surface." Approximately one woman has the disease to every five men affected. Legge (1), of the University of California, says: "The reason women have less ringworm of the feet is that their habits are cleaner and they observe a much higher type of personal hygiene. They perspire less. They wear lighter, lower-cut shoes, which are better ventilated, and are changed oftener." Redden (18), of the American Red Cross, says: "Probably if we all wore thin stockings and sandals the problem would be solved." The writer believes that if it were the general custom to wear close fitting woollen or leather mitts, winter and summer, 15 hours daily, "athlete's hand" would be as prevalent as "athlete's foot."

The reason that the affection became so noticeably prevalent among soldiers in the Great War was obviously because they were forced to wear heavy boots for long periods, in trench warfare, under very faulty sanitary conditions. It was not because they may have "picked up" the specific fungus at some local swimming pool! On the contrary, the lack of adequate bathing facilities was, perhaps, the most potent etiologic factor. As a matter of fact, the modern swimming pool with its shower baths, antiseptic foot baths, and chlorinated water, followed by exposure of the feet to fresh air and sunlight, offers the best prophylactic and curative treatment for this condition.

The flood of advertising propaganda stressing the supposedly contagious nature of this affection, as broadcast by radio and the daily press, has given the public, and many of the medical profession, the wrong view of the situation. This has resulted in the general trend to chase the elusive fungus, which plays a secondary role, rather than to strike at the basic cause of the trouble,—faulty foot hygiene. As a result of this erroneous conception of the nature of the malady an elaborate ritual of precautionary measures has developed in public and private aquatic life, in the futile attempt to prevent contact with the supposedly specific organism involved. Some authorities advise the restricted use of the towel after the bath, drying the surface of the body from the head downward, using the towel on the feet last,—a thing which everybody does instinctively without medical advice. But, is it possible for thousands, perhaps millions of spores to be liberated from the infected areas daily, even while we sleep, without exposing all parts of the body surface to the fungi? Likewise, in the operation of public baths and swimming pools certain precautionary measures have become standard practice. These include the liberal use of soap in the showers, and rigid enforcement of their use; antiseptic foot baths, so placed that all must use them; the frequent disinfection of locker room floors, and the use of impervious material in their construction. All these are most commendable as general sanitary measures; but emphasis of an anti-ringworm

objective in the use of these may defeat its own end by aggravating an already super-developed consciousness to the alleged danger of contagion. Some health authorities have gone so far as to specify that "no one who is known to be infected should be allowed to use the baths till cured". Recognition of the widespread distribution of the fungi and prevalence of the affection should convince anyone of the futility of such measures as a means of preventing contagion. The obvious conclusion is that we have been attacking the problem from the wrong angle.

Foot-hygiene

In a paper published about a year ago, the writer (19) recommended a concerted educational campaign for better foot hygiene, as a means of combating this trouble at its source. The following suggested prophylactic measures may be found helpful:

(1) Ignore the inspired medical advice of antiseptic vendors, and patronize your local out-door swimming pool as much as possible during the summer months, when your feet suffer most from confinement in shoes. The exposure to air, sunlight and water is nature's corrective.

(2) Wear light, loosely fitting shoes, preferably of canvas, or sandals in summer; and thin stockings, preferably cotton or rayon.

(3) Bathe the feet frequently, using soap freely. Thoroughly dry the toe interspaces and dust freely with boracic acid or talcum powder, to which may be added salicylic acid (2 per cent).

(4) Henderson (20) has recommended the fumigation of shoes, using formaldehyde. This may be done by inserting in the toe of each a pledget of absorbent cotton moistened with a few drops of formalin, and confining in an ordinary shoe box or metal container over night.

(5) In cases where the affection seems persistent, the use of a 1 per cent solution of sodium hypochlorite or hyposulphite, or 0.1 per cent of potassium permanganate, as a foot bath, will be found very effective, when used in conjunction with the measures referred to under section 3.

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COLONEL SIR ALBERT GOODERHAM, K.C.M.G., V.D., LL.D.

THE announcement of the death of Colonel Sir Albert Gooderham on April 25th at his residence, "Deancroft", Toronto, was received with the deepest regret by his many friends throughout Canada as well as in Great Britain and the United States. Long known as an outstanding public-spirited citizen whose assistance and judgment were constantly sought, Sir Albert gave generously of his time and means to numerous philanthropies and service organizations. He was an ardent advocate of every movement which had for its objective the strengthening of our Imperial ties and the development at the same time of all that was truly Canadian. To him new advances in the field of medicine made an instant appeal and moved him to consider at once their practical application in Canada. He delighted in keeping in touch with the progress of public health and preventive medicine. Of very especial concern to him was the problem of tuberculosis, particularly in the case of little children. The building and equipping for the Imperial Order of the Daughters of the Empire of a modern preventorium in Toronto which now accommodates 128 children predisposed to tuberculosis, was a natural expression of his thoroughly practical mind which was not content with anything less than adequate provision for such children. No one who knew him could fail to appreciate the pleasure which he shared with Lady Gooderham in doing good deeds unobtrusively.

During the Great War Colonel Gooderham's talents and resources were dedicated wholly to the service of the Empire. His ability and experience enabled him to make a series of notable contributions, including the establishing and equipping of Hyde Park Place Hospital in London and an epic accomplishment in the production, without profit, of vast quantities of acetone on an extraordinarily economical basis. Also, distressed by the acute shortage of anti-tetanic serum for the protection of the wounded, he donated to the University of Toronto a fine farm with laboratories, stables, and living-quarters to accommodate the increasing needs of the Antitoxin Laboratory which had been established in April, 1914, by Dr. J. G. FitzGerald in the Department of Hygiene of the University for the promotion of research in the field of immunity and the preparation of antitoxins, vaccines and sera. Thus this venture became the Connaught Laboratories, so named by Colonel Gooderham whose unsolicited benefaction brought to fruition the development of an institute worthy of the

Dominion of Canada in the field of preventive medicine and treatment of disease. His unflagging interest in the development and activities of the Laboratories was always an inspiration and made an undying contribution to their accomplishments. These, like his many other good works, will ever live after him and his memory will always be revered and cherished.

A SURVEY AND A CONCLUSION

THE presentation, at the recent annual meeting in Toronto, of a series of twelve reports by the officers of the Association and by the chairmen of the various committees served to visualize the extent of the Association's responsibilities and to impress every member with a new sense of the opportunity which is open to the Association to make a vital contribution in the solution of certain problems.

In 1928 the Association stood at the cross-roads. It was suggested that amalgamation might be effected with other agencies: the physician-members might reasonably be expected to concentrate their activities in the Section of Preventive Medicine of the Canadian Medical Association; the nursing groups might similarly give their support to the Canadian Nurses Association; laboratory members had before them the opportunity of closer relationship with the various societies in the United States. Was there a definite place in Canada for a national public health association? Was there something that alone could be obtained by the contact of physicians, nurses and others in public health assembled in annual meetings and through their united efforts to advance the practice of preventive medicine? What services could such an association render to those engaged in public health work? Should the objective be the interpretation of the modern health movement to the public through campaigns of popular health education or should such work be left to the national agencies which had been established to meet the needs of the special fields of venereal disease control, mental hygiene, and child welfare? The decision was made to continue the Association and to define its purposes as those which relate more strictly to a professional society of health workers.

With this decision, it was at once evident that the Association could serve its members best by the publication of a scientific journal of preventive medicine which would present the recent advances in public health and the findings of the provinces and municipalities in the conduct of health work. It was evident also that the annual meetings, to be effective, should be technical in character. Further, it was realized that the work of the Association could be conducted only through the services of national committees which would undertake detailed studies of specific problems through the co-operation of the various departments of health and universities.

In proceeding with these plans, it was felt that in the course of a very few years the Association would receive ample financial support to make possible the appointment of a full-time general secretary with a suitable office and at least one assistant. It was confidently expected that editorial supervision in the publication of the JOURNAL would be provided by the appoint-

ment of at least a part-time editor. Such provision seemed the very minimum, but the economic conditions of the past years have made it impossible for the Association to implement these plans in any way. The work of the General Secretary has been conducted without any office assistance provided by the Association. The Honorary Treasurer likewise has given generously of his time and provided the necessary office services. During the past seven years the Association was able to employ a full-time office assistant in connection with the editing of the JOURNAL for a period of less than a year. In spite of the handicaps, the work of the Association has been carried forward.

To appreciate the importance of the year's activities, one needs only to refer to the various reports which were submitted at the annual meeting. A notable increase in the membership of the Association has been achieved, the total membership being more than 2,600. This is the more noteworthy when it is remembered that the membership of almost all professional societies has suffered reductions, frequently to a very serious extent, during the past few years. The publication of the JOURNAL may rightly be considered to be of major importance. Its value as a means of bringing to every medical officer of health the consensus of opinion regarding the best administrative procedures, the new findings in specific immunization, and advances in sanitation, as well as in the highly specialized fields, is at once evident. Through the JOURNAL Canadian contributions have been made known and much has been published of the progress of public health in the various provinces which otherwise would not have been recorded. The increase in the circulation of the JOURNAL to 3,062 from 1,490 when the Association assumed its publication in 1928 indicates the appreciation of the efforts of the Association.

Probably no other action of the Association so reflects the recognition of the new position which the Association occupies than that of the acceptance of the responsibility by the Association for the certification of sanitary inspectors. It is indeed gratifying that within a few months the first examinations for the Association's certificate will be conducted through the co-operation of the various provincial departments of health and the Canadian Institute of Sanitary Inspectors.

The Association has been able, through its Section of Vital Statistics, to render valuable assistance to the Dominion Bureau of Statistics. Through the Section's Committee on the Certification of Causes of Death, studies were made, the findings of which were presented to the Dominion Bureau and were duly incorporated in the new Canadian death certificate. The report of this committee lays the foundation for definite improvement in the accuracy of the national vital statistics through increasing interest and appreciation by the practising physicians.

The importance also of the annual report of the medical officer of health has been laid before every municipal officer by the Association. To assist him in its preparation and to achieve a degree of uniformity in the presentation of vital statistics, statistical forms have been prepared which embody the best practice. Closely associated with the work of this committee is that of the committee engaged in a study of the problem of more accurate municipal statistics by redistributing births and deaths according to place of residence.

For four years this committee has continued its studies and substantial progress has been achieved.

In the Public Health Nursing Section and in the Laboratory Section committees have been actively engaged in important investigations. In the latter Section the preparation of Canadian Standard Methods, of Recommended Laboratory Procedures, and of a Directory of Laboratory Personnel has been undertaken. The holding of a special mid-year meeting at the Christmas season has greatly increased the value of the Section.

The reports constitute a survey of the year's activities. The conclusion is clear and definite: the Association must be provided with a more adequate budget if the work already undertaken is to be carried forward and new obligations assumed.

AN APPRECIATION OF THE GENERAL SECRETARY

WHEN the history of the Association is written the outstanding feature of the record will be the fact that the Association's work has been conducted by its members who in every instance have given, in the various executive offices, generously of their time and the best of their ability to its advancement. No other national voluntary health agency in Canada has attempted to carry on its work even for a period of a few years without at least one salaried executive officer to maintain its enthusiasm and to guide its program. The Canadian Public Health Association throughout its entire history has functioned without such support. The responsibilities and duties of the General Secretary have increased with each succeeding year as the Association has rapidly extended its activities. Since assuming his duties in 1922 at the annual meeting which was held in Saint John, N.B., Dr. J. T. Phair has continued to serve as General Secretary. Such a record of service is at once an expression of successful leadership and of the hearty confidence of his fellow-workers in public health throughout Canada. At every annual meeting of the Executive Council expressions of appreciation have been tendered to Dr. Phair and he has been persuaded to continue in office. The Executive Council, facing the pressing demands of the enlarged work of the Association, again has been greatly encouraged this year by his willingness to continue as General Secretary. In making the presentation of a handsome piece of Sheffield plate to mark in a special way his thirteen years of service, Dr. W. J. Bell, chairman of the Executive Committee, reviewed in a most pleasing manner the contribution which Dr. Phair has made to the promotion of the Association's activities, expressing the hearty thanks and good wishes of the Council. This action of the Executive Council will be greatly appreciated by every member of the Association and will have their heartiest approval.

REPORTS
from the
Twenty-fourth Annual Meeting
Held in Toronto June 3, 4 and 5, 1935

Part I*

REPORT OF THE GENERAL SECRETARY
1934-1935

THE report of the General Secretary of the Association ceased, some years ago, to be a significant document. Actually it is to be considered as an appropriate preface to the statements made by the various officers and the reports of such sub-committees as have been charged with responsibilities by your Executive Committee. It is the custom, however, to take advantage of this opportunity to review the Association's progress, to wax reminiscent and, on occasion, to attempt to forecast coming events. In order that the present incumbent of the position may be considered orthodox, I would say that, despite existing conditions, the Association has continued to go forward, expanding both its influence and its membership.

Looking backwards, one finds the same difficulties presenting themselves—some blatantly unashamed, others cleverly disguised. Increase in membership implies increase in interests; both involve increased demands on those who voluntarily assume directional responsibilities. The problem of maintaining the CANADIAN PUBLIC HEALTH JOURNAL on the high standard already set, of publishing the great number of excellent papers offered, and of obtaining sufficient advertising revenue to meet the additional costs—these are becoming perennial problems; others are hardy annuals. Venturing into the field of prophecy, I would like to say that this Association will continue to flourish just as long as the inspirational influence and the indefatigable interest of the group who, from year to year, give so unstintingly of their time to serve this organization are continued, pertinent to which observation I wish, here, to pay tribute to the efforts of Dr. Defries and Mr. Randall, on behalf of the Association. To Dr. Fenwick also the Association is deeply indebted for his services as Honorary Treasurer.

During the year just completed, your executive officers have seriously attempted to carry on the activities and extend the sphere of influence of the Association. The reports of the Treasurer and the Editorial Board are proof positive of the vigilance and enthusiasm of your officers; while the efforts of those making up the various standing committees are briefly stated in the appended reports of the Committee on the Certification of Sanitary Inspectors, the Committee on the Certification of Causes of Death, the Committee on the Annual Report of the Medical Officer of Health, and the Committee on Non-Resident Births and Deaths. A statement on the present position of the various provinces in respect to milk control is included this year.

Certain Sections of the Association, particularly the Laboratory, the Vital

**Other reports from the annual meeting will be presented in the July and August issues.*

Statistics and the Public Health Nursing Sections, have carried on intra-convention programs, which can be considered as tangible evidence of enthusiasm on the part of the Section officers and members.

The Association has received the hall-mark of approval of the Public Health Committee of the Canadian Life Insurance Officers' Association, a grant of $1,000.00 having been recommended by that Committee.

History repeated itself last year at Montreal, when the Association held one of the most successful meetings since its inception. Not only was the attendance the second largest in the records of the Association, but the interest manifested and the hospitality extended were in keeping with what we have come to expect from our French-speaking colleagues.

Honorary membership was conferred upon Dr. E. Pelletier, who for many years was associated in an administrative capacity with the Provincial Bureau of Health for Quebec. If Dr. Pelletier would only show some evidence of growing old, we could have appropriately said that he had grown old in the service of the people of that province.

I beg to record an increasing interest in the subject of state controlled health or sickness insurance. Not only have the four western provinces committed themselves to the establishment of some type of state directed program of medical care for certain classes of the community, but the Federal Government has assumed more than a casual interest in this problem. To what extent this service is to be considered as a part of the public health program as at present constituted, remains to be seen.

The mid-year meeting of the Laboratory Section was again held in Toronto during the Christmas vacation, with an even larger attendance than in the two preceding years.

In conclusion, might I say that your Executive Committee held three meetings during the year. All matters referred to it by the Council and such questions of Association interest as have presented themselves for solution during the year have been dealt with either as directed by Council or in such fashion as was felt by the Committee to be in the best interests of the Association.

J. T. PHAIR, *General Secretary.*

REPORT OF THE HONORARY TREASURER

IN presenting the audited report of the Association for the year ending December 31, 1934, I am glad to be able to state that no deficit has been incurred in the conduct of work during the past year, in spite of the continued conditions which adversely affected the income of the Association. Instead of any restriction in the activities of the Association, the work has been further enlarged through new undertakings of the Sections and the JOURNAL has been further improved.

One of the most gratifying features of this report is the marked increase in the support of the Association through increased membership. Last year the

amount received was $2,704.55, which was a reduction from the amount of the previous year. This year, $3,004.40, an increase of approximately ten per cent, has been received from the membership fees and JOURNAL subscriptions. The Association has continued to enjoy the support of all of the provincial departments of health and the JOURNAL has been supplied to the medical officers of health and other members in these departments throughout Canada.

For several years valued support has been received from several of the Canadian life insurance companies through the basis of Sustaining Membership. This year I have great pleasure in stating that the Canadian Life Officers' Association has formally granted one thousand dollars to the Association as a contribution to the work of the year 1935. It is planned to continue to solicit Sustaining Membership from the interested companies in other fields, thus enabling them to express their interest in the work of the Association in a highly practical manner. Such support might reasonably constitute one of the Association's most important resources. I hope, therefore, that it may be possible, as conditions improve, for the Finance Committee to present this matter to several companies.

The annual convention which was held in Montreal was one of the largest in the history of the Association. It is credit to the Executive Committee that this important meeting was conducted with an expenditure of only $477.94. The problem of financing the annual meeting has received much thought from the Finance and Executive committees. It is recognized that this matter will become increasingly serious as each year the annual convention, with its many sections and committees, requires a larger expenditure. Funds must be provided for the publication and distribution of preliminary and final programs, the printing of the annual report which makes available to the annual meeting the findings of the important committees of the Association, the expenses of guest speakers and of additional clerical assistance, and expenses incurred in the actual conduct of the meetings. Travel expenses incident to the meeting have not been a large item, but under present conditions definite provision must be made for the meeting in Vancouver next year. Consideration has been given to the charging of a registration fee from those attending the annual meeting. Although it was decided to postpone such action for this year, I would urge that the matter be considered further at this meeting of the Executive Council. The place and value of scientific and commercial exhibits in the annual meeting should also be considered. From the standpoint of the financing of the annual meeting, the revenue obtained from commercial exhibitors may become highly important. Much would be gained if a definite policy could be established so that gradually commercial exhibitors would be impressed with the importance of the annual meeting of this Association. The Association shared in the commercial exhibits at the provincial meeting in Ontario of the Ontario Health Officers' Association and the Ontario Medical Association in May, 1934, and received thereby $400, without which, I may add, it would not have been possible to balance our budget this year.

In reference to the publication of the JOURNAL, it will be noted that although a larger number of papers have been published and there has been a consider-

able increase in the number of copies distributed, the printing and production costs are practically the same as for the previous year. This has been accomplished by the utmost care in the preparation of material for printing, reducing in this way the charges for changes to a minimum. The income from advertising was practically the same as last year, amounting to $4,058.73.

In connection with the circulation of the JOURNAL it is of particular interest that more than 200 undergraduate medical students and graduate nurses enrolled in public health nursing courses in our Canadian universities are subscribers for the JOURNAL. This has been made available to them on a special subscription rate. It is probable that no other journal on this continent enjoys such a measure of practical interest as is manifested in the CANADIAN PUBLIC HEALTH JOURNAL by the undergraduates in our colleges in Canada.

The urgent necessity of an adequate revenue for the Association has been pointed out in previous reports. The growth of the Association's activities, particularly during the past two years, demands the immediate appointment of one full-time office assistant. The generous assistance of the Canadian Life Officers' Association this year in supplementing the budget will make possible this appointment, which, however, will not reduce in any way the amount of service required to be rendered voluntarily by those who are carrying the responsibilities of the Association.

As to possible sources of increased income, I have already mentioned Sustaining Membership and the holding, annually, of an Exhibit Section. Attention is being given by the Finance Committee to the possibility of increased advertising revenue from the JOURNAL. Further, an increase in the membership fee might reasonably be considered when economic conditions are improved.

The assets of the Association, as presented in the balance sheet, exhibit 1, include one thousand dollars invested to yield 4½ per cent. Every effort should be made to increase such investments in order that the Association may have some resources to meet emergent needs.

The Association gratefully acknowledges the co-operation of the Canadian Social Hygiene Council for use without charge of office space and other facilities, and also the time and work of officers of that organization without remuneration. To the Provincial Department of Health of Ontario, and the School of Hygiene, University of Toronto, our thanks are due for valuable services similarly rendered and for their practical manifestation of interest in the Association.

I have much pleasure in attaching the audited statements for the year ending December 31, 1934.

TO THE OFFICERS AND MEMBERS OF
THE CANADIAN PUBLIC HEALTH ASSOCIATION

We report that we have made an examination of the books of account of the CANADIAN PUBLIC HEALTH ASSOCIATION, as publishers of the PUBLIC HEALTH JOURNAL, for the period of Twelve Months ended December 31, 1934. We completed the writing up of the books and drew therefrom the Trial Balance as at December 31, 1934; calculated the amount of unexpired subscriptions from the list thereof supplied us, and prepared the following appended exhibits:

Exhibit 1—Balance Sheet as at December 31, 1934.
2—Statement of Income and Expenditure for the year ended December 31, 1934.

CERTIFICATE

We hereby certify that the Balance Sheet appended as Exhibit 1, and the related Statement of Income and Expenditure, Exhibit 2 hereto, are in our opinion properly drawn up so as to exhibit a true and correct view of the affairs of the Association as at December 31, 1934, according to the best of our information, the explanations given us, and as shown by the books of the Association.

All of which is respectfully submitted.

TORONTO, MARCH 16, 1935.

(*Signed*) SEBURN, FERGUSON & BAKER,
Chartered Accountants.

CANADIAN PUBLIC HEALTH ASSOCIATION

BALANCE SHEET
DECEMBER 31, 1934

ASSETS

Current Assets:			
Cash on hand and at Bank		$1,027.23	
Accounts Receivable—Advertising	$ 347.72		
Subscriptions	258.83		
Reprints	76.43		
Total	$ 682.98		
Less: Reserve for Doubtful Accounts	53.88		
		629.10	
Deposits with Postmaster		15.00	
Deferred Charges		50.47	
TOTAL CURRENT ASSETS			$1,721.80
Investments:			
Province of Ontario Bonds—at cost	$1,012.50		
TOTAL INVESTMENTS			1,012.50
Fixed Assets:			
Canadian Public Health Journal		$1,000.00	
Office Equipment		35.00	
TOTAL FIXED ASSETS			1,035.00
TOTAL ASSETS			$3,769.30

LIABILITIES AND SURPLUS

Current Liabilities:		
Accounts Payable—Trade	$ 661.83	
Commissions Payable	27.39	
Prepaid Subscriptions	345.11	
Honoraria Payable	200.00	
TOTAL LIABILITIES		$1,234.33
Surplus—January 1, 1934	$2,217.36	
Add: Net Income for year ended December 31, 1934	267.61	
and Honorarium (1933) cancelled	50.00	
SURPLUS—December 31, 1934		2,534.97
TOTAL LIABILITIES AND SURPLUS		$3,769.30

Attached to and forming a part of our Report dated March 16, 1935.

STATEMENT OF INCOME AND EXPENDITURE

FOR TWELVE MONTHS ENDED DECEMBER 31, 1934

INCOME

Advertising	$4,058.73	
Subscriptions	3,004.40	
Miscellaneous Revenue	213.31	
GROSS INCOME		$7,276.44

EXPENDITURE

Printing		$4,375.42	
Cuts and Sundries		211.52	
Postage on Magazines and Mailing Cost		558.12	
Commissions		420.08	
Advertising and Promotion Expense		75.40	
Honoraria and Stenographic Services		535.20	
Stationery and Office Supplies		188.98	
Postage and Telegraph		245.47	
Miscellaneous Expense		196.37	
Convention and Meetings Expense	$ 477.94		
Less: Receipts therefrom	405.00		
		72.94	
Discounts Allowed and Exchange		88.98	
Reserve for Bad Debts		40.35	
TOTAL EXPENDITURE			$7,008.83
NET INCOME—for year 1934—Carried to Exhibit 1			$ 267.61

Attached to and forming a part of our Report dated March 16, 1935.

C. P. FENWICK, *Honorary Treasurer.*

REPORT OF THE EDITORIAL BOARD

THIS report is the seventh annual report of the Editorial Board, for it was in 1928 that the Association assumed the responsibility for the publication of the JOURNAL. Just prior to that time, the Association stood at the cross-roads considering whether or not the Association should cease to function. In doing so, it was believed that the Association, in purchasing and becoming responsible for the publication, would be greatly strengthened by the increased interest of the membership in all phases of the Association's work. The wisdom of the decision to go forward and assume the responsibilities of the JOURNAL and to enlarge, in other ways, the Association's activities, has been amply manifested by the evidence of the new life of the Association and of its definite achievements during these particularly difficult years.

It is well at this time to remember that, in making the plans in 1928, it was expected confidently that within two or three years the Association would be able to appoint an editor with at least a full-time office assistant. During the past seven years, however, the Association was able to employ a full-time office

assistant for a period of less than a year. As a result, the work of the Association has been conducted by the various officers utilizing their own office personnel in conducting the essential correspondence of the Association and arranging for office work out of regular hours. It is when such handicaps are considered that the remarkable progress of the Association stands out as a challenge to the future.

In this connection, as chairman of the Editorial Board, I would like to express, on your behalf, our sincere appreciation to Mr. Robert Randall who, as editorial assistant, has devoted many hours of his time outside his regular duties in the School of Hygiene to the preparation of the JOURNAL.

Sharing in the responsibilities of the JOURNAL with the members of the Editorial Board, I should like to record, particularly, the services of Dr. N. E. McKinnon and Dr. J. T. Phair as assistant chairmen of the board, who have given generously of their time to the JOURNAL from the inception of the effort in 1928.

Seventy-two leading articles and twenty editorials were published in the twelve issues constituting volume 25, 1934. In addition, eghteen other papers appeared in the various departments, while the reports from the annual meeting occupied thirty-one pages. Twenty-six books were reviewed and sixty-three articles published in other journals were abstracted in the department of Current Health Literature by Dr. James Craigie. Even more acute than in previous years has been the problem of accommodating all the papers presented at the various meetings—the annual meeting in Montreal in June, the meeting of the Ontario Health Officers' Association in Toronto in May, the Saskatchewan Health Officers' Association in September, and the third annual Christmas meeting of the Laboratory Section on December 20th and 21st—in addition to the many papers from contributors throughout Canada.

Several minor changes were made in the format of the JOURNAL in January. Smaller type is now being used for the editorial section and for the departments of *Books and Reports* and *News from the Field*, in order to accommodate more material in the same amount of space, and more attractive type has been adopted for the department headings. It is interesting to note that the printing costs (exclusive of mailing charges and postage) have been reduced from 13.5 cents per copy in 1933 to 12.3 cents in 1934.

Advertising. For the year 1934 the revenue from advertising was $4,058.73, almost identical with the receipts of last year. Twenty companies and institutions were represented in the advertising columns during the year. More than 150 prospective advertisers were kept informed about the JOURNAL through statements sent to them several times during the year.

Circulation. For the six months ending December 31, 1934, the average monthly distribution was 3,062 copies as compared with 2,832 for the same period in 1933, an increase of 230 copies per month. The increase from the circulation of 1928, which was practically 1,500, to the present total of more than 3,000 is striking.

Growth of Circulation

Average Monthly Circulation

1927.....*1,490*	1932.....2,799
1930.....2,326	1933.....2,832
1931.....2,653	1934.....*3,062*

The revenue from membership fees, including subscriptions for the JOURNAL, was $3,004.40 for the twelve months of 1934, as against $2,704.55 for 1933, an increase of $299.85, which is a most gratifying indication of the increasing interest in the Association.

Student Subscriptions. In December, 1934, the special subscription offer was extended to members of the graduating classes in medicine in McGill and Queen's Universities and the Universities of Toronto and Western Ontario, and to students in public health nursing in McGill University and the University of Toronto. One hundred and one students took advantage of the offer, so that this year the JOURNAL is reaching 239 medical students and public health nurses in training.

The Board is deeply grateful to Dr. George F. Buchan, medical officer of the Willesden Urban District Council, Kilburn, London, who, in spite of his many official duties, has continued to find time for the preparation of his quarterly letter on public health developments in Great Britain. In the first two years of its publication, Dr. Buchan's letter has become one of the outstanding contributions to the JOURNAL.

A feature that made its appearance in the May 1934 issue was the first of the series of contributions from the Department of Epidemiology and Biometrics, School of Hygiene, University of Toronto, presenting the endemic index for diphtheria, scarlet fever, measles and whooping cough in the provinces of Canada and indicating the importance of such indices to the health officer in enabling him to note the trend of the incidence and to judge the importance of increases in the number of reported cases. Indices for later periods were published in the September, January and May issues and will be continued at intervals of four months.

The series of historical articles on the development of public health in the provinces of Canada has been continued and will be completed by the publication in the September and October issues of outlines of the development in Nova Scotia and Saskatchewan, after which the collected articles will be reprinted as the fourth in the Association's Reprint Series.

Reprint Series. The establishing of the reprint series of publications of important contributions to the JOURNAL has been received with widespread appreciation. The following reprints have been published:

(1) Special Milk Number, January, 1932.

(2) The Treatment of the Paralyses of Poliomyelitis—Jean Macnamara, M.D., November, 1932.

(3) Essentials in the Production of Safe Milk, January, 1934.

Requests for copies of "Essentials in the Production of Safe Milk" are still being received and almost 1,200 copies have been distributed. The editions of the other two reprints have been exhausted.

The ministers and the deputy ministers of the provincial departments of health have, in spite of increasingly difficult times, continued to enrol as members of the Association their medical officers, public health nurses and other members of their respective departments. To them we would express once more the appreciation which we so often have had occasion to voice. This very tangible evidence of their interest in the Association and in its JOURNAL has stimulated us to renewed efforts to issue a publication worthy of their confidence.

The Editorial Board desires again to express its appreciation to Mr. R. J. Hamilton and the staff of the University of Toronto Press for their continued co-operation and helpfulness in the publication of the JOURNAL.

R. D. DEFRIES, *Chairman.*

FOURTH REPORT OF THE COMMITTEE ON NON-RESIDENT BIRTHS AND DEATHS

FOLLOWING a meeting of the committee held at Montreal in 1932, at which the various methods of procedure in the allocation of births and deaths by residence in other countries were reviewed, the committee decided that only statistics compiled on this basis accurately reflected the facts. This opinion was expressed in the committee's first report and recommendations, which were adopted by the Section and were forwarded to the Dominion Bureau of Statistics.

The committee was subsequently advised by the Bureau that special work had been undertaken which involved a hand-count of births and deaths for the years 1930, 1931 and 1932, according to residence. It was felt that this work would reveal the weaknesses in statements of residence, difficulties to be encountered, and other features essential to a system of reallocation. It would also make available statistics corrected by complete redistribution for Canada, and assist the Bureau in drawing up official rulings and definitions. The committee's last report indicated the progress made with this special investigation and desired the Dominion Bureau of Statistics to indicate its future intentions in reference to allocation by place of residence in national compilations.

During the last year the Dominion Bureau has completed its special investigation and has published three reports: (1) births by residence of mother, (2) mortality by residence of decedent, and (3) mortality from tuberculosis by residence of decedent. These reports are most valuable for they indicate what may be expected of a national system of allocation on this new basis. The committee has prepared tables* from these reports which show the percentage change effected in the rates for certain cities by re-allocation

**Owing to limitations of space the tables are omitted from this presentation of the report.*

procedures. These data support the contentions of this committee and illustrate the fallacy of existing mortality statistics, particularly for urban centres with organized health and hospital facilities. The committee is advised by the Bureau that routine allocation of deaths by residence as well as by place of occurrence is being undertaken, beginning January, 1935. For this purpose a new tabulation card has been constructed and it is hoped that routine classification of births may be begun in 1936. Such tabulations will tentatively be supplementary to those by place of occurrence, in accordance with the recommendations made in the committee's first report.

Rules and Procedure

In previous reports, adopted by the Section and approved by the Dominion Bureau, it was recommended that "usual place of abode" should determine residence in the case of a death; and in the case of a birth, the usual place of abode of the mother. It has also been pointed out that "since the population figure, as shown by a Census, provided the denominator in computing the majority of statistical rates, it is logical to allocate births and deaths by residence *in accordance with the adopted rules of Census practice* in this country." The Bureau has recently indicated in a communication to the committee that this is the general principle on which the allocation of deaths by place of residence will rest.

The Dominion Bureau has indicated the tentative basis on which allocation by residence is being carried out, as follows:

(1) Deaths occurring in hospitals, maternity homes, nursing homes, etc. (except members of the staff whose home is in the institution), will be allocated to the usual fixed residence of the deceased.

(2) Although in the census inmates of tuberculosis sanatoria, homes for incurables and mental hospitals are enumerated as residents of the area in which the institution is situated, exceptions will be made to the general rule in these cases in allocation of deaths. The deaths of inmates of such institutions will, in the classification by residence, be transferred back to their usual residence before entering the institution.

(3) For other institutions the same rules will be followed as in the census. Inmates of prisons, reformatories, jails, penitentiaries, alms houses, homes for orphans, homes for the blind, homes for the deaf and dumb, soldiers' homes and homes for the aged, will be considered as residents of the communities in which such institutions are situated, and the length of residence in an institution will not be considered in the matter of residence.

(4) Deaths of infants occurring in the institutions in which they were born and which they have never left, will be allocated to the usual residence of the mother.

(5) Where the place of residence is unknown, the death will be assigned to the place of occurrence.

(6) Deaths of non-residents of the country will be assigned to the place in which they have occurred.

(7) Interprovincial transfers for residence will be made.

The Dominion Bureau has indicated that at a later date these rules will be published in fuller detail in order to consolidate the basis of practice for

municipal and provincial use, and not make it necessary to refer to the book of "Instructions to Commissioners and Enumerators" for the census rules.

In recent correspondence, Mr. Coats welcomed any comment upon the tentative rules employed.

This committee is in full agreement with the exceptions indicated in the case of tuberculosis sanatoria, homes for incurables, and mental hospitals, for which the justification is clear. There is just as much reason for reallocating these deaths as any others and despite the fact that inmates of these institutions are included in the population which forms the denominator of the death rate, the death rates of communities containing such institutions and of those centres to which the deaths are referred will more nearly represent the actual state of affairs when the deaths of inmates of these institutions are excluded than when they are included. The percentage change in the urban rates for tuberculosis by reallocation clearly illustrates this point.

The sole source of information as to residence is that given on the death certificate and this question on the new certificate has been made as clear as possible. For larger cities the Bureau will make use of street indexes. Undoubtedly it will be necessary to return a number of certificates for verification of residence, where there is any doubt. The difficulties surrounding reallocation by residence are many and will be a factor against entire accuracy in such classification.

The definition and rules of procedure outlined will serve as a guide to those attempting to allocate births and deaths by residence in the various provincial or municipal offices. It would seem to be well not to adopt a uniform code of procedure as yet, in order to have the benefit of a year or so of experience.

Substantial progress has been achieved and now that the Bureau has given leadership in this matter and undertaken routine reallocation by residence, the committee will be in a better position during its next session to investigate the feasibility and practicability of initiating a scheme for the interchange of certificates within each province, having in mind the need for current municipal statistics corrected for the factor of residence.

In conclusion, the committee wishes again to take the opportunity of expressing its sincere appreciation to Dr. Coats and his colleagues, not only for the manner in which they have co-operated with the committee, but for the lead they have taken in this fundamental step toward improving the accuracy and increasing the value of vital statistics in Canada. The committee wishes to retain its identity for a period in the hope that it may be able to be of further service to the Dominion Bureau of Statistics.

T. E. ASHTON, *Chairman.*
GRANT FLEMING, M.D.
W. R. TRACEY.
D. V. CURREY, M.D.
PAUL PARROT, M.D.

EPIDEMIOLOGY AND VITAL STATISTICS

THE TREND OF MORTALITY IN THE PRE-SCHOOL CHILD

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MUCH of public health effort and study in recent years has been concentrated in the first year of life and rather less attention paid to children of pre-school age. Our greater concern over mortality in the first year of life is principally because of the heavy death toll during this time. Infant mortality also readily lends itself to statistical study since it is measured directly against the live births for the same period. The mortality among children in the second, third, fourth and fifth years of life, however, is expressed per unit of population at these ages and, except for census years, this population can be obtained only by estimation. This study deals with mortality between the first and fifth birthdays during the twelve-year period 1921-1932 in Canada, excluding Quebec ("registration area as of

TABLE I

DEATH RATES PER 100,000 POPULATION FROM CERTAIN CAUSES BY SINGLE YEARS OF AGE, BETWEEN THE FIRST AND FIFTH BIRTHDAYS IN THE REGISTRATION AREA AS OF 1921, DURING THE YEARS 1921-32.

Int. List No.	Causes of Death	1 year	2 years	3 years	4 years
1, 2	Typhoid and paratyphoid fever	1	2	2	2
6	Small-pox	(1)	(1)	(1)	(1)
7	Measles	55	16	9	7
8	Scarlet fever	16	19	16	14
9	Whooping cough	74	20	9	6
10	Diphtheria	32	39	45	44
11	Influenza	75	31	20	14
13	Dysentery	12	5	4	2
15	Erysipelas	3	1	(1)	(1)
16	Poliomyelitis and polioencephalitis (acute)	5	4	3	3
18	Epidemic cerebrospinal meningitis	8	5	3	3
23-32	Tuberculosis, all forms	62	37	29	23
23	Tuberculosis of the respiratory system	23	15	11	9
24	Tuberculosis of the meninges and central nervous system	29	16	13	10
25-32	Other forms of tuberculosis	10	6	5	4
63, 64	Rickets and osteomalacia	16	3	1	1
79	Simple meningitis	24	11	6	6
86	Convulsions	31	8	4	3
89	Diseases of the ear and mastoid process	10	3	2	2
106	Bronchitis	16	4	3	2
107	Bronchopneumonia	152	43	20	13
108	Lobar pneumonia	47	17	9	6
109	Pneumonia, not specified	68	25	13	8
114	Other diseases of the respiratory system	2	1	1	1
119, 120	Diarrhoea and enteritis	159	50	25	15
157	Congenital malformations	21	6	3	2
176-198	Accidental deaths	76	66	53	45
	Other specified causes	150	95	83	72
199, 200	Unspecified or ill-defined causes	43	13	8	6
	All causes	1,156	524	373	299

(1) Less than 1 per 100,000 population.

**Data used in this paper in the form of tables and charts were supplied by the kindness of Mr. W. R. Tracey of the Dominion Bureau of Statistics.*

1921"). The figures for Quebec are available only since 1926 when Quebec entered the system of national vital statistics, and for this period such data are presented separately.

The mortality rates used in this paper are based on population estimates for intercensal years made by the Dominion Bureau of Statistics. These estimates are based upon births in the appropriate years and mortality in subsequent periods, and are sufficiently accurate to justify the time comparisons which are made. The trend in mortality which is evident in this study is so marked that the effect of any slight inaccuracies in the estimates of population used may be disregarded.

The mortality under one year of age is roughly six times the mortality between the first and second birthdays and, from table I, the mortality between the first and second birthday is 2.2 times that between the second and third birthday; the risk between the second and third is 1.4 times that between the third and fourth birthday; and the risk between the third and fourth birthday is 1.25 times that between the fourth and fifth birthday. These differences in risk do not apply equally to all important causes of death, as is well known. Table I shows, also, for example, that mortality from diarrhoea and enteritis and pneumonia decline rapidly with increasing age. Measles and whooping cough show similar declines. On the other hand, scarlet fever shows no evidence of a decline and the diphtheria mortality is actually higher at three and four years of age than at the age of one or two years.

For certain causes as rickets and congenital malformations, the decline with age is, as expected, very marked. Of vital importance is the fact that the mortality from accidental causes ranks third in the chief causes in the first year of life (table I), and is first in the other three age-groups. It shows a decline after the first year but this is not as marked as the decline in all causes considered as a group.

Tuberculosis ranks eighth in the first year among the causes of death, sixth in the second year, fourth in the third year and fourth in the fourth year. The tuberculosis rate does, however, decline definitely as age increases from one to four years, but the decline after age two is much less marked than in the case of diarrhoea and pneumonia.

THE GENERAL MORTALITY TREND

The rates of mortality for all causes and for certain specified causes in Canada (registration area as of 1921) for 1921-1931 among children 1-4 years of age are given in table II.

In 1921 the specific mortality rate among children 1-4 years of age was 7.13 per thousand. Every succeeding year shows a decline in this rate with the exception of the years 1926 and 1929, both of which were years when the mortality from influenza amongst the total population was higher than in the preceding years. In neither case could the increase in child mortality from this cause, however, account for the total increase, but an analysis of the tables shows a definite and decided increase in infections of the lower respiratory passages, such as bronchitis, bronchopneumonia and lobar pneumonia, during these years. This was especially true of the children in the age-groups one to two years. Similarly, mortality from tuberculosis of the respiratory system was considerably higher in 1926 than in the two preceding or the three ensuing years. In 1930 the mortality rate fell 15 per cent over the preceding year; in 1931, 15 per cent over 1930; in 1932 the rate fell to a low for all time of 3.98 per 1,000. This rate is only 56 per cent of the rate in 1921.

TREND OF MORTALITY FROM CERTAIN CAUSES

In table II, certain interesting facts are evident in respect of the trend of mortality from certain causes.

Diarrhoea and enteritis ranked first

TABLE II

DEATH RATES FROM CERTAIN CAUSES PER 100,000 POPULATION BETWEEN THE FIRST AND FIFTH BIRTHDAYS, IN THE REGISTRATION AREA AS OF 1921, DURING THE YEARS 1921-1932

Int. List No.	Causes of Death	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
1, 2	Typhoid and paratyphoid fever	3	2	3	1	2	1	2	1	1	1	2	1
6	Small-pox	1	(1)	(1)	1	..	(1)	..	..	..	..	..	(1)
7	Measles	22	15	25	36	14	39	20	14	35	15	4	13
8	Scarlet fever	30	23	22	24	17	15	14	9	15	12	8	5
9	Whooping cough	32	26	39	24	27	32	26	23	28	22	20	19
10	Diphtheria	77	63	46	51	36	32	36	35	39	26	24	15
11	Influenza	14	36	50	23	34	42	37	39	59	23	28	27
13	Dysentery	9	6	7	4	6	4	5	4	6	10	4	3
15	Erysipelas	2	1	1	1	1	1	1	1	2	1	1	1
16	Poliomyelitis and polioencephalitis (acute)	..	5	3	4	2	4	5	6	5	6	3	2
18	Epidemic cerebrospinal meningitis	..	5	3	4	4	5	5	6	8	7	4	4
23-32	Tuberculosis, all forms	37	35	37	42	36	40	34	33	41	39	38	32
23	Tuberculosis of the respiratory system	12	12	16	18	15	16	11	12	18	15	16	13
24	Tuberculosis of the meninges and central nervous system	17	17	15	18	17	17	18	15	18	16	17	15
25-32	Other forms of tuberculosis	8	6	7	6	4	7	5	7	5	8	5	5
63, 64	Rickets and osteomalacia	3	5	4	6	4	6	5	5	6	7	5	5
79	Simple meningitis	25	11	10	14	8	8	12	13	9	11	8	6
86	Convulsions	14	16	13	13	11	13	9	9	12	9	9	7
89	Diseases of the ear and mastoid process	3	2	2	3	4	5	7	6	4	5	4	5
106	Bronchitis	11	11	9	7	4	6	4	4	5	4	3	2
107	Bronchopneumonia	59	71	70	52	47	63	52	55	66	41	47	38
108	Lobar pneumonia	14	21	19	19	16	24	23	21	23	21	15	15
109	Pneumonia, not specified	43	38	40	23	25	34	30	26	27	17	16	15
114	Other diseases of the respiratory system	2	2	1	1	1	1	1	1	1	2	1	1
119, 120	Diarrhoea and enteritis	92	78	59	55	63	49	60	53	63	79	42	32
157	Congenital malformations	4	2	7	8	11	11	6	8	12	9	7	9
176–198	Accidental deaths	67	63	65	59	59	58	56	62	60	61	58	50
	Other specified causes	114	103	91	102	97	98	97	97	115	102	92	80
199, 200	Unspecified or ill-defined causes	35	24	19	17	16	14	18	12	14	11	12	9
	All causes	713	666	646	593	544	607	566	544	654	540	455	398

(1) Less than 1 per 100,000 population.

among the chief causes of death in children 1-4 in 1921, but in 1932 had fallen to third place. In general, the trend in mortality from this cause is downward although it had epidemic variations and hence wide fluctuations. In 1930 the death rate rose to its highest point since 1921. This, however, was a particularly bad year for infectious conditions involving the intestinal tract both in adults and children. *Dysentery*, which may be considered with this group, shows a similar downward trend, with a decided upward swing in 1930. The rates in 1931 and 1932 in all these conditions were, however, below any previously recorded for the period.

The combined rates for *pneumonia and bronchitis* show a gradual decline, but not beginning until 1924. A definite increase occurs in the epidemic influenza years. *Influenza* itself shows no definite trend, showing peaks of mortality in 1923, 1926 and 1929.

Similarly, tuberculosis (all forms) shows no definite trend.

Of the so-called "children's diseases," diphtheria and scarlet fever showed marked reduction. The rate for diphtheria was 77 in 1921 and 15 in 1932. The rate for scarlet fever was 30 in 1921 and 5 in 1932. Mortality from measles and whooping cough, however, show no definite trend. It is striking that while the mortality from whooping cough was less than half that due to diphtheria in 1921 and 1922, it was nearly equal to it in 1930 and 1931, and surpassed it in 1932.

In general, the very low specific death rate from all causes in the age-group under discussion in recent years is due in part to the reductions which have been going on over the whole period in mortality from certain causes, notably diphtheria and scarlet fever. The mortality from intestinal diseases, except for an increase in 1930, has shown a decidedly favourable trend, as has also the mortality from pneumonia and bronchitis.

TABLE III

MORTALITY RATES* (ALL CAUSES) BETWEEN THE FIRST AND FIFTH BIRTHDAYS
Canada—1921-1932
(Registration Area as of 1921)

Year	1-4 years		1 year	2 years	3 years	4 years
	Crude	Standardized				
1921	7.13	7.03	13.48	6.23	4.89	3.99
1922	6.66	6.48	12.14	6.58	4.02	3.61
1923	6.46	6.36	13.27	5.50	4.15	3.01
1925	5.93	5.94	11.72	5.09	3.92	3.44
1925	5.44	5.57	11.47	5.00	3.48	2.74
1926	6.07	6.16	13.15	5.51	3.59	2.90
1927	5.66	5.72	11.52	5.03	3.86	2.88
1928	5.44	5.51	11.06	5.15	3.51	2.72
1929	6.54	6.61	13.06	6.06	4.19	3.59
1930	5.40	5.41	10.34	4.97	3.74	2.94
1931	4.55	4.54	9.43	3.89	3.02	2.17
1932	3.98	3.95	7.89	3.91	2.44	1.85

*Rates per 1,000 population.

THE MORTALITY TRENDS BY SINGLE YEARS OF AGE

In table III, crude and standardized death rates by age are presented.

Thus for children at one year of age during the 12 years, the rate declined 41.4 per cent; 37.2 per cent for children two years of age; 50.1 per cent for children three years of age, and 53.6 per cent for children four years of age. At each age, the rates for 1926 and 1929 (the "flu" years) showed an increase over the preceding year, but the general downward trend is preserved in each age-group.

THE TREND OF PRE-SCHOOL MORTALITY IN QUEBEC PROVINCE, 1926 TO 1932, INCLUSIVE.

The mortality at the ages 1-4 years in the province of Quebec was approximately twice the rate in the remaining eight provinces. A downward trend was, however, equally well-marked. The rate for 1932 was particularly diarrhoea and enteritis, and certain epidemic diseases.

The mortality from diarrhoea and enteritis was high in 1930 and 1931, but dropped in 1932. The rate for dysentery is very low through the whole period. This may be due to differences in the diagnostic practice in Quebec, such cases being more frequently returned as enteritis.

TABLE IV

DEATH RATES PER 100,000 POPULATION FROM CERTAIN CAUSES BY SINGLE YEARS OF AGE BETWEEN THE FIRST AND FIFTH BIRTHDAYS IN THE PROVINCE OF QUEBEC DURING THE YEARS 1926-1932

Int. List No.	Causes of Death	1 year	2 years	3 years	4 years
1, 2	Typhoid and paratyphoid fever	5	8	7	6
6	Small-pox	(1)	(1)	(1)	..
7	Measles	126	40	17	10
8	Scarlet fever	36	37	29	21
9	Whooping cough	140	34	14	7
10	Diphtheria	60	60	66	59
11	Influenza	230	93	48	30
13	Dysentery	7	3	3	2
15	Erysipelas	4	2	1	(1)
16	Poliomyelitis and polioencephalitis (acute)	15	9	9	7
18	Epidemic cerebrospinal meningitis	17	10	6	4
23-32	Tuberculosis, all forms	105	55	49	36
23	Tuberculosis of the respiratory system	51	20	16	11
24	Tuberculosis of the meninges and central nervous system	36	23	23	18
25-32	Other forms of tuberculosis	18	12	9	8
63, 64	Rickets and osteomalacia	42	16	5	2
79	Simple meningitis	90	37	25	22
86	Convulsions	45	9	3	2
89	Diseases of the ear and mastoid process	18	8	3	4
106	Bronchitis	17	5	1	1
107	Bronchopneumonia	349	104	50	26
108	Lobar pneumonia	49	18	9	6
109	Pneumonia, not specified	109	37	19	13
114	Other diseases of the respiratory system	3	2	1	(1)
119, 120	Diarrhoea and enteritis	413	100	48	28
157	Congenital malformations	21	5	4	2
176–198	Accidental deaths	73	68	54	49
	Other specified causes	307	161	127	114
199, 200	Unspecified or ill-defined causes	40	10	5	3
	All causes	2,319	934	604	453

(1) Less than 1 per 100,000 population.

7.7 per one thousand population as compared with 11.9 in 1926, being, therefore, only 65 per cent of the latter figure, while in the eight provinces the rate was 66 per cent of the 1926 figure.

The excess of the Quebec rate from all causes over the rate for the "Registration Area" is distributed over a number of important causes,

Mortality from typhoid and paratyphoid fever was also higher, ranging from 3 to 15 per 100,000, whereas the rate in the "Registration Area" has not exceeded 2 per 100,000.

Influenza and bronchopneumonia also contribute heavily to the mortality.

Diphtheria shows a markedly

TABLE V

DEATH RATES FROM CERTAIN CAUSES PER 100,000 POPULATION BETWEEN THE FIRST AND FIFTH BIRTHDAYS IN THE PROVINCE OF QUEBEC DURING THE YEARS 1926-32

Int. List No.	Causes of Death	1926	1927	1928	1929	1930	1931	1932
1, 2	Typhoid and paratyphoid fever	7	15	8	3	5	3	3
6	Small-pox	(1)	..	1	..	(1)	..	..
7	Measles	75	67	33	40	59	21	24
8	Scarlet fever	29	34	31	38	32	28	22
9	Whooping cough	75	67	31	37	45	35	30
10	Diphtheria	67	83	73	61	58	53	33
11	Influenza	141	74	103	154	53	72	70
13	Dysentery	4	1	4	4	5	6	2
15	Erysipelas	1	4	2	2	(1)	2	2
16	Poliomyelitis and polioencephalitis (acute)	3	5	2	8	6	27	20
18	Epidemic cerebrospinal meningitis	8	7	7	10	13	10	4
23-32	Tuberculosis, all forms	65	63	54	66	64	63	44
23	Tuberculosis of the respiratory system	26	25	25	28	24	23	13
24	Tuberculosis of the meninges and central nervous system	26	21	19	28	28	28	22
25-32	Other forms of tuberculosis	13	17	10	10	12	12	9
63, 64	Rickets and osteomalacia	17	17	24	17	15	10	11
79	Simple meningitis	49	45	41	54	54	31	18
86	Convulsions	18	18	13	15	13	12	9
89	Diseases of the ear and mastoid process	8	6	7	9	8	8	9
106	Bronchitis	7	5	7	6	5	6	6
107	Bronchopneumonia	129	123	141	143	121	121	101
108	Lobar pneumonia	19	19	22	25	15	18	19
109	Pneumonia, not specified	50	59	49	50	44	23	22
114	Other diseases of the respiratory system	(1)	1	3	1	1	(1)	1
119, 120	Diarrhoea and enteritis	148	163	130	130	151	150	102
157	Congenital malformations	8	7	9	8	8	6	7
176-198	Accidental deaths	55	57	56	63	61	70	63
	Other specified causes	174	190	177	177	181	167	145
199, 200	Unspecified or ill-defined causes	29	11	9	16	14	9	8
	All causes	1,187	1,141	1,037	1,137	1,031	951	774

(1) Less than 1 per 100,000 population.

TABLE VI

CRUDE, SPECIFIC AND STANDARDIZED DEATH RATES FROM ALL CAUSES BETWEEN THE FIRST AND FIFTH BIRTHDAYS IN THE PROVINCE OF QUEBEC DURING THE YEARS 1926-32
(Rates per 1,000 population)

Year	1-4 years		1 year	2 years	3 years	4 years
	Crude	Standardized				
1926	11.87	12.02	27.33	11.20	6.36	4.33
1927	11.41	11.46	25.46	9.80	6.84	4.75
1928	10.37	10.69	23.88	8.72	6.33	4.75
1929	11.37	11.69	25.85	10.78	6.02	5.16
1930	10.31	10.47	22.87	9.47	5.97	4.48
1931	9.51	9.61	20.93	8.15	5.93	4.25
1932	7.74	7.79	15.72	7.27	4.79	3.97

downward trend from 1927, and scarlet fever in the years 1931 and 1932 was progressively lower.

The general tuberculosis rate as in the "Registration Area" shows no definite trend, but the rate for 1932 in Quebec dropped in a striking fashion from 62 to 44.

Table VI gives crude and standardized death rates by age.

This table shows that the mortality at one year of age has declined 42.5 per cent; at 2 years, 35.1 per cent; at 3 years, 24.7 per cent; at 4 years, 8.3 per cent. Thus the improvement which is evident at these ages as a whole (1-4 years) is in particular due to improvements in mortality at ages 1 and 2 years. This is a marked contrast to the picture in the other eight provinces.

DISCUSSION

The data presented in this paper indicate that the health status of the children of this age-group is improving.

A study of table III and table VI shows that the mortality rates of children of various ages comprising the group in both cases are also decidedly less now than they were about a decade ago. It is of particular interest to note that the decline in mortality among children at these ages is maintained in spite of the depression. There is no doubt that the average baby of to-day is much healthier than the baby of ten or fifteen years ago, rickets, malnutrition, scurvy, diphtheria and other preventable conditions being much more infrequent. Parents give greater attention to, and show more concern over all infections in infants. The pasteurization of milk, improved and simplified methods of infant feeding, the establishment of baby health stations and well-baby clinics, along with the extensive circulation of literature in pamphlet form and in the press and household magazines, with the activities of federal, provincial and municipal health organizations, have inquestionably contributed toward this gratifying result. The effect of this care of the baby has undoubtedly been in large measure responsible for improvement at succeeding ages, particularly so since care of the toddler is also improving as a result of health teaching. There would seem to be no reason why the downward mortality trend should not continue, apart, of course, from epidemic outbreaks from time to time.

Epidemics of scarlet fever have been mild for several years and if this favourable condition continues, with the wider use of the specific preventive agents, a further reduction in scarlet fever deaths should result. It would appear also that diphtheria deaths will eventually become very uncommon, and perhaps later also, deaths from tuberculosis. Reduction, too, in mortality from diarrhoea, enteritis and dysentery may be looked for as the problem receives increasing attention, particularly in the rural areas.

Health education of the people, especially the parents of the pre-school child, should receive more attention than it does at present. Many children die each year from bronchopneumonia who should never have developed this disease. The tendency to neglect the common cold or to allow a child to be up and around with acute or sub-acute bronchitis or tonsilitis, and the indifference and lack of concern shown over grippe-like infections, are without doubt often responsible for the frequently fatal complication of bronchopneumonia.

The low mortality among pre-school children is gratifying, but it in no way indicates that health workers should overlook the importance of their efforts in this age group. Rather, an even greater expenditure of energy is warranted, more especially in the field of health education, with the establishment of facilities for the periodic examination and follow-up of the pre-school child. An extension of baby health and welfare enterprise and activities to the older age-group is indicated.

LABORATORY SECTION

BACTERIOLOGICAL STUDIES OF UNDULANT FEVER IN CANADA*

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THE term undulant fever refers to an illness considered, from clinical symptoms, serological tests and bacteriological studies, to be caused by organisms belonging to the genus Brucella. Cases of undulant fever have now been reported from every province of the Dominion except Prince Edward Island. It is, however, probable that the disease may exist there, but has not been reported. The apparent increasing incidence of the malady in Canada is somewhat misleading. While the first case of undulant fever reported in Canada was in 1928 by Harris,[1] many physicians recall having treated, previous to 1928, cases of undiagnosed infections which they are now reasonably certain were cases of undulant fever. Since, however, the chain of clinical symptoms accompanying Brucella infections in the human often parallels closely the clinical symptoms of other infections, and since there is a lack of bacteriologic proof, the correct answer must be left to supposition.

The increasing number of cases of undulant fever being diagnosed is, no doubt, partially because of the increased interest in and the improved methods of diagnosing the disease.

The most important information regarding an infectious disease is that pertaining to the etiology and to the mode of transmission. The undulant fever problem concerns chiefly the dairy industry and public health. The dairyman is confronted with not only a diminished milk supply and with the loss of valuable foundation stock, but with the menace to the health of his family. The farmer asks, Will my family contract undulant fever by drinking milk from my infected herd? The physician asks, Is the apparent increasing incidence of undulant fever in Canada caused by an infection transmitted from the domestic animal? The scientist asks, Which of the three varieties of Brucella organisms represents the etiological factor in fevers clinically and serologically diagnosed as undulant fever?

In the hope of obtaining information relative to these questions, the bacteriological investigations reported in this paper were undertaken. The work was carried out at Macdonald College, McGill University, in co-operation with the Provincial Bureau of Health, Quebec, and the Medical Faculty of McGill University. Previous to this investigation, the author had carried on bacteriological investigations concerning Brucella disease in cattle and had shown that the organism concerned was usually the bovine type (*Brucella abortus*). The infection is present in approximately twenty per cent of the dairy herds in Canada. Since, then, we are dealing with a disease the apparent etiological factor of which is almost universal in distribution, it is evident that we are confronted with a problem of greater magnitude than is generally recognized.

METHOD OF STUDY

It is obvious that correlated information is of greatest value when the collective information has been obtained at the same time, by the same worker, and under the same circumstances. History relates many examples of almost fruitless results because of a one-sided method of

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attacking a tangled problem. The etiological factor of Malta fever was observed by David Bruce in 1886, and that of infectious abortion by Bernard Bang in 1897. Although the two organisms were studied extensively, each in its own segregated field, the observation that the two organisms were almost identical was not made until 1918. It seems almost incredible that two organisms could have been so extensively studied over a period of twenty-one years without their identity having been observed. It should be realized that comparative studies carried out concurrently on the etiological factor of an infection occurring in widely separated hosts have a much enhanced value over collective studies carried out by various workers under varying circumstances. Considering the advantages of an extensive and correlative method of attack, the author has attempted to isolate the suspected causal organism from the blood of the patient and, at the same time, from the milk, cream, or dairy products used by the patient. No bacteriological investigations concerning contact infection were carried out, but information received by questioning concerning possible contacts is here recorded.

If a Brucella organism was isolated from both the patient and from the likely source of infection (milk, cream or dairy products), the two were compared morphologically and physiologically. Members of the Brucella group possess certain physiological characteristics which are of marked value in classification. Unfortunately, however, these characteristics are frequently evident only at the time of original isolation and disappear after the organisms have been cultured for variable periods. The most important of these characteristics is the carbon-dioxide requirement of the abortus variety; this characteristic, however, may disappear after a few days' cultivation or after several transfers. Thus, it may clearly be seen that concurrent comparative studies are to be desired when attacking the undulant fever-infectious abortion problem.

TECHNIQUE OF ISOLATION

Cultural methods only were used in the detection and isolation of Brucella organisms. It must be admitted that the standard methods of culturing bacteria from infective materials have been developed for use in well-equipped laboratories, it being imperative that the infective material be collected at the location of the laboratory or that it be transported from the place of collection to the laboratory in such a way that the chances of being able to isolate the suspected organism are not seriously affected. It is obvious that in the bacteriological investigation of an infectious disease which appears most frequently in rural isolated districts, frequently with limited transportation facilities and usually without laboratory equipment, the difficulty of transporting infective material in a condition suitable for bacteriological analysis to a base laboratory is considerable. The difficulty is more pronounced with milk and blood than with other types of fluids. The materials to be cultured in the investigation of undulant fever are blood, milk, cream and dairy products.

In order to overcome the serious obstacle of transporting the fluids to be cultured to the base laboratory, the author has developed a technique whereby cultures may be prepared at the scene of the disease with an accuracy and efficiency comparable to the standard methods used in well-equipped laboratories. The technique has been described in detail by Thompson[2] and is termed the "spun-tube" method.

The culture medium used was similar to that described by Stafseth;[3] this had been found highly suited for the isolation of Brucella organisms from experimental animals and from cattle. So far as the author is

aware, this represents the first attempt to culture bacteria on the surface of agar films on the inside of glass tubes. The advantages of such a technique compared to the Petri-plate method when preparing cultures at locations distant from a laboratory are very evident. Since by this method the prepared agar film is protected against contamination by the use of a cotton stopper, they may be transported great distances without danger of contamination. When spreading any type of inoculum over the surface of agar films, it is essential to guard against extraneous contamination, especially if the culture medium is particularly suited to the growth of common contaminants such as moulds. (This is true for the culture medium used in growing *Brucella abortus*). Since in the spun-tube technique the inoculum such as blood is delivered to the tube directly from the syringe used for collecting the blood, or with a pipette in the case of cream or dairy products, and the distribution is accomplished by either spinning the tube by use of the described machine or by rotating it in a horizontal plane by hand, the danger of introducing contamination is very markedly reduced. Any worker who has attempted surface-culture technique in a private home or even in the average laboratory will readily realize the difficulty in preventing contamination when using a bent glass rod or wire to distribute mechanically the inoculum; such a method requires that the agar film be exposed to the air during the interval of the distribution. On many occasions when culturing milk from animals which had recently aborted, excellent results were obtained by simply milking a small amount of milk directly from each quarter into a prepared tube. This technique eliminated even the use of a collecting flask or pipette. If, however, there was no apparent evidence of Brucella infection in a suspected animal, a volume of milk sufficient to give about ten cubic centimeters of cream was collected and the gravity cream was used for culturing.

In the culturing of patients' blood, inoculations were also made into liver broth. From these broth cultures weekly platings were made for a period of five weeks. If the case being investigated was reasonably close to the laboratory, milk samples, taken separately from each quarter of a suspected animal, were taken to the laboratory, and, after the cream was allowed to separate by gravity, one-tenth cc. quantities were spread over the surface of poured Petri-plates by a technique described by Thompson.[4]

On receiving a report of a case of undulant fever from the Bureau of Health, a series of spun-tubes was freshly prepared, the patient was visited personally, and a 20 cc. sample of blood was collected from the median cephalic vein by means of a 20 cc. syringe. One cubic centimeter amounts were added to a series of spun-tubes, and the remainder, except about 2 cc. to be used for serological tests, was added to 100 cc. of liver broth. The spun-tubes were then held in a horizontal plane and rotated by hand until the entire surface of the agar film was smeared with the blood. The inoculated flask of liver broth and the inoculated spun-tubes were placed in a chest-refrigerator and kept there until the return to the base laboratory.

After careful and extensive questioning regarding the source of milk and dairy supplies, the most probable source of infection was visited, and samples of milk or dairy products were obtained. Depending upon the circumstances, either cultures were made directly (using spun-tubes) or samples of the milk or other dairy products were collected into sterile flasks. The inoculated spun-tubes or the samples were then packed in a chest-refrigerator and were taken, along with the blood cultures, to the base laboratory.

All cultures were made and incubated in duplicate, one set aero-

bically and the other set in an atmosphere containing 10 per cent carbon dioxide. All cultures were incubated at 37°C. for five days, at which time they were examined; if no Brucella colonies were found, incubation was continued, with periodic observation, for a period of five weeks.

IDENTIFICATION OF THE ORGANISM

While five-day colonies of *Brucella abortus* are characteristic, the appearance of the colony alone was not considered sufficient for a final positive diagnosis. A colony suspected of being *Br. abortus* was inoculated in duplicate to liver infusion agar slopes, one tube being incubated aerobically and the other incubated in an atmosphere containing ten per cent carbon dioxide. The reaction to the carbon dioxide was noted, and the organisms growing only in the carbon-dioxide-rich atmosphere were labelled as *Br. abortus*. Films were stained by the Hucker modification of the Gram stain. Each culture considered to be *Br. abortus*, after microscopic and cultural tests, was tested serologically to substantiate the diagnoses. Table I shows the bacteriological findings of the cases of undulant fever studied.

DISCUSSION

The bacteriological findings reported in Table I substantiate the hypothesis that undulant fever as it appears in Canada is usually contracted from bovine sources. Apart from the direct bacteriological findings, it is pertinent to note that every patient suffering from undulant fever used raw cream or raw milk, while not a single case occurred in individuals using pasteurized milk and cream. Some very recent observations, however, indicate that goats or hogs may be an indirect contributing factor. The history of goats in herds considered to be the source of the infection, coupled with the isolation of aerobic strains of Brucella organisms from the blood of the patient using milk from the herd, indicates that cattle may be infected with the caprine or suis strains. Samples of goat's milk collected from various sources have, however, failed to reveal Brucella organisms. None of the samples of goat's milk was obtained on farms incriminated as the source of infection in cases of undulant fever. Many dairymen maintain one or two goats in their herd of dairy cattle with the idea that tuberculosis and other diseases are repressed; the goats in these cases are usually males. In the vicinity of Montreal there are a few herds of goats maintained for the express purpose of producing milk. This milk seems to be sold to hospitals or to private homes and is frequently used by invalids. The author has not made a systematic study pertaining to the presence of Brucella organisms in these milks, but the few samples studied have not shown the presence of Brucella organisms. It is interesting to note that an aerobic strain of Brucella was isolated from patient no. 6; the milk used by this patient was from a herd consisting of three cows and one goat. The organism isolated from the milk supply, however, proved to be *Brucella abortus*. An aerobic strain of Brucella has recently been isolated from milk obtained from the milk of a cow which had aborted two days previously; this cow was from a herd which had recently experienced a severe epidemic of infectious abortion. In other countries it appears that cattle frequently become infected with the caprine or suis strains.

Table I shows that Brucella organisms were isolated from only seven of the twenty-three cases studied. The suspected milk supply, however, yielded positive results in sixteen out of twenty-one cases (milk used by cases nos. 7 and 10 was not examined). It is much more difficult to isolate *Brucella abortus* organisms from blood than from milk. It is

TABLE I

RESULTS OF BACTERIOLOGICAL INVESTIGATIONS ON UNDULANT FEVER IN CANADA

Case Number	Sex	Age	Occupation	Milk Supply	Contact with	Brucella Isolations	
						Patient	Milk supply
1	Male	45	Priest	College farm	Cattle, hogs	+	+
2	Male	40	Hotel keeper	One cow	Cattle	−	+
3	Female	26	Nurse	Hospital farm	.....	−	+
4	Female	59	Nurse	Seminary farm	.....	+	−
5	Male	59	Carpenter	Three farms	Cattle, goats	+X	+
6	Male	40	Farmer	Home farm	Cattle	−	−
7	Female	50	Farmer's wife	Home farm	Cattle	−	O
8	Male	15	Farmer's son	Home farm	Cattle	−	+
9	Male	17	Farmer's son	Home farm	Cattle	+	+
10	Female	62	Retired	One cow	.....	−	O
11	Male	50	Farmer	Home farm	Cattle	+	−
12	Female	28	Wife of physician	Local farm	.....	−	+
13	Female	31	Farm employee	Home farm	.....	−	+
14	Female	30	Wife of newspaper editor	City supply	.....	−	−
15	Male	28	Farmer	Home farm	Cattle	−	−
16	Male	18	Farmer	Local farm	Cattle, goats	+	+
17	Male	37	Farmer	Home farm	Cattle	−	+
18	Male	31	Priest	Local farm	.....	−	+
19	Male	28	Farmer	Home farm	Cattle	−	+
20	Male	26	Baggage man	Local farm	Cattle	−	+
21	Female	52	Wife of physician	Local farm	.....	−	+
22	Male	6	Farmer's son	Home farm	Cattle	−	+
23	Male	18	Farm employee	Home farm	Cattle, goats	+	+

NOTE—All cases used raw milk.

Code: O=no test.
X=aerobic growth

important also that the blood samples from the patient be obtained during the pyrexial period. Many of the cases studied could not be visited until after the pyrexial period had passed, so that the percentage of positive results is not as high as one might expect if a more systematic and prolonged bacteriological investigation were carried out.

SUMMARY

Based on the results of a bacteriological study of twenty-three cases of undulant fever occurring in the Province of Quebec, the author considers that *Br. abortus* is frequently the etiological factor concerned and that infection is usually from the use of unpasteurized infected milk or cream. The problem of bovine infection with caprine or suis strains should be investigated.

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BOOKS AND REPORTS

Annual Report of the Surgeon-General of the Public Health Service of the United States for the Fiscal Year 1934. Published at United States Government Printing Office, Washington, 1934. 143 pages. Price 75 cents (cloth).

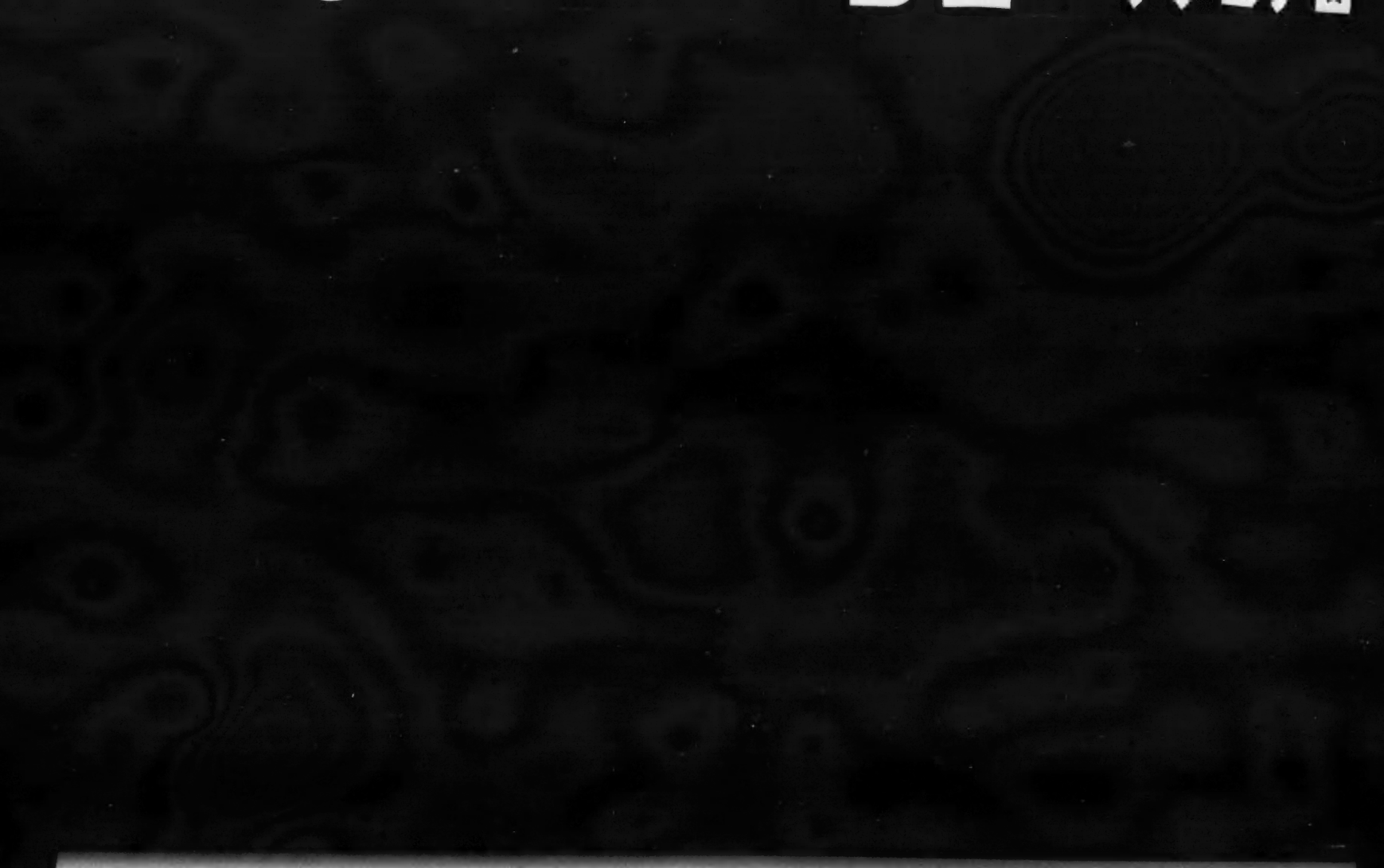
This, the sixty-third annual report of the Surgeon-General of the United States Public Health Service, covers the one hundred and thirty-sixth year of the existence of this great health organization.

As a preface to the reports of the various divisions of the service, the Surgeon-General reviews briefly health conditions in the world as a whole and in the United States in particular. There appears to be no definite evidence that existing economic conditions have adversely affected the health of the American people. For the fiscal year reviewed the general death rate was the lowest on record, as also were the specific mortality rates from diphtheria and typhoid fever. The Surgeon-General comments briefly on various phases of the work of the Public Health Service, drawing attention to specific activities and recent advances in the work of each.

The detailed reports of the work of the various divisions of the Public Health Service are presented in order, viz., the divisions of Scientific Research, Domestic Quarantine, Foreign and Insular Quarantine and Immigration, Sanitary Reports and Statistics, Marine Hospitals and Relief, Venereal Diseases, Mental Hygiene, and the divisions of Personnel and Accounts. A provisional financial statement shows expenditures for the fiscal year 1934 to have been approximately eight and three-quarter millions of dollars.

A.H.S.

Venereal Disease: Its Prevention, Symptoms and Treatment. By Hugh Wansey Bayly, M.C. Fifth Edition. Published by Chapman and Hall, Ltd., 11 Henrietta Street, London, W.C.2, England, 1934. 260 pages, with 3 coloured plates and 74 illustrations. Price, 10/6 net.

The fact that this book has had the happy experience of five editions since 1919 greatly lightens the task of the reviewer. The author in his preface clearly indicates that he has presented a concise review of venereal diseases in the hope that it will place the essentials for the prevention, diagnosis and treatment of these diseases in a short clear and simple manner before the student and general practitioner. He has succeeded extremely well. It is gratifying to note the frank statements Dr. Bayly makes in his chapter on prevention and his insistence upon the necessity of the biological attitude towards venereal diseases. This chapter might with great profit be read by all teachers and students of medicine. The book is profusely illustrated. The subject matter is well and concisely presented; it is up-to-date and authoritative. The book can be unreservedly recommended.

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